# THIRTY-SEVENTH QUARTO VOLUME



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# RAILROAD GAZETTE

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## A British Railroad Gazette.

An international combination publication, in London, of the *Railroad Gazette* together with the best known railroad paper in England will begin in the first week in July. The method of republication of nearly all the reading pages in this British edition makes it desirable and necessary to change the size of the leaf and the form of making-up to which the *Railroad Gazette* readers have been accustomed for a generation. London *Transport*, which is the partner in the edition for Great Britain and other Eastern continents, has maintained a vigorous increase in growth during the past 13 years, both in value and in a great foreign circulation, and it affords the best possible basis for such a railroad publication as the world needs.

For the *Railroad Gazette* there are many advantages. The combined editorial staff and correspondents will get more surely and accurately improvements in railroad engineering and in operating methods in all countries. Correspondents may be assured that their articles will be seen wherever there are railroads and railroad officers, and this is alike true of advertisers in the *Railroad Gazette*. In amplifying the science and in working out the art of transportation, *Transport and Railroad Gazette* has an important mission. It is an inspiring undertaking and its editors and publishers have a deep feeling of responsibility in the serious work which is before them. If it is well done the world will be benefited.

## The Economy of the 50-Ton Box Car.

The 50-ton box car is not a rarity on American railroads. The mere fact that the Pennsylvania has adopted cars of this capacity as standard is a strong argument in their favor as having an earning capacity greater than the 30-ton or 40-ton car. An analysis of their real value must take into consideration two important points: Can the greater loads which they will carry be obtained, and if so what is the money value of their greater carrying capacity during a given period over and above the additional first cost and the cost of hauling the extra dead load due to their weight?

If the necessary facts are at hand, it is not hard to arrive at the actual increase in earning power in a given period of time, of the 100,000 lb. car over the 80,000 lb. car, provided both are loaded to their maximum capacity during that period. A concrete example serves best for such a calculation and the following data have been taken from the report of a railroad which fairly represents average operating conditions in the United States. Such assumptions as have been made are conservative and not far from actual values. The comparison is of two box cars, both having bodies of the dimensions adopted as standard by the American Railway Association (36 x 8½ x 8), one of 80,000 lbs. capacity and the other of 100,000 lbs. capacity. The first will cost $1,100 and weigh 41,400 lbs., the second will cost $1,150 and weigh 43,000 lbs.; a difference of $50 in cost and of 1,600 lbs. in dead weight, due largely to the heavier trucks used. On the road in question, the gross operating expenses chargeable to freight were $13,196,142 which includes an equitable proportion of all charges for maintenance, repairs and improvements to track, bridges and other structures together with charges for enginemen and trainmen, repairs to cars and locomotives, fuel, water, oil and all other charges usually included in operating expenses. The total ton-mileage for the year, including dead weight of cars, estimated at 29,000 lbs. each, was 6,281,032,000. Dividing this figure into the gross operating expenses, makes the average cost of moving one ton one mile, 2.1 mills. The average yearly mileage of cars was 11,300 miles. The excess weight of the 100,000 lb. car over the 80,000 lb. car being 1,600 lbs. or .8 ton, the excess ton miles per car for the year, due to running the larger car, would be .8 x 11,300 or 9,040 ton-miles. At 2.1 mills, the cost of moving this excess dead weight in each car would be $18.98. Add to this the interest at 5 per cent. on the excess first cost of $50 and the total cost per year of the 100,000 lb. car over the 80,000 lb. car is found to be $21.48.

With 10 per cent. overload, the larger car has 11 tons greater capacity than the smaller car. The net earnings per ton-mile on this road were 5.6 mills. The excess net earnings per mile run of the 100,000 lb. car over the 80,000 lb. car, both loaded to their maximum, will therefore be 11 x 5.6 mills or 6.16 cents. The excess cost per year of the 100,000 lb. car is $21.48; hence the large car must travel 2,148 ÷ 6.16, or 349 miles, fully loaded, before it begins to show a saving over the 80,000 lb. car. For every mile traveled over and above 349 miles the larger car when fully loaded earns 6.16 cents per mile in excess of the 80,000 lb. car. If it ran its entire mileage, loaded to its maximum capacity, it would show a gain in earning capacity of $674.50 for the year.

But, unfortunately, the assumption on which the above calculation is based, that both cars are loaded for their entire mileage at their maximum capacity, which includes a 10 per cent. overload above the marked capacity, cannot, as a matter of fact, ever be realized in actual operation. The value of the large car as an earning factor depends solely on the possibility of obtaining loads for it which exceed the capacity of the smaller car. The cubic capacity of the American Railway Association standard box car which measures 36 ft. long, 8 ft. 6 in. wide and 8 ft. high is 2,448 cu. ft. If a 100,000 lb. car of these dimensions is loaded with wheat to its capacity of 110,000 lbs. the load would come to within 6 in. of the roof. On the other hand, a car loaded with 88,000 lbs. of wheat would have a load coming to within 2 ft. of the roof; which approximates much nearer to actual loading and unloading conditions. All of the other grains usually carried in bulk weigh from three to five pounds less per cubic foot than wheat and hence could not be used in fully loading the 100,000 lb. car under any circumstances. The common kinds of lumber weigh from 30 to 45 lbs. per cubic foot, or from 3 to 18 lbs. less than wheat. Only a few articles suitable for bulk shipments can be loaded in sufficient quantities to equal the maximum for the 100,000 lb. car, cotton in round bales, bricks, pig metal, paper in rolls or bundles and a few less common commodities. Under the most favorable circumstances, full carloads cannot always be obtained even for bulk shipments and in the case of miscellaneous merchandise and high-class freight, it is seldom, if ever, that a car can be loaded to anything like its full capacity of 55 tons. On the Missouri Pacific after four years of educating shippers and agents in loading cars to their fullest capacity, the average shipment of general freight per car from 23 of the largest stations, was 11,688 lbs. This is less than one-seventh the capacity of the smaller of the two cars that we have been considering, and yet it is looked upon as a highly creditable accomplishment, and justly so. It is no doubt a much larger average than can be found on any similar road which has not given special attention to loading.

In building 50-ton cars to be used for one or two kinds of lading—as, for example, coal and iron ore—no mistake has been made. Everybody agrees that the economy in wages and in track room far outweighs all disadvantages. If a single commodity—say wheat from Lake Erie to the Atlantic Ocean—could be had in sufficient volume to keep a particular lot of cars well employed, similarly satisfactory results might be had with box cars; but in dealing with general traffic the very large "ifs" in the foregoing calculations must be kept constantly in mind. The proportion of our general traffic which must be moved in loads of moderate weight or bulk, because of the need of promptness or the wishes—either businesslike or whimsical—of shippers and consignees, is very large, and with the increased density of population is increasing. The use of a single standard size of car has an element of wastefulness, at best. In England and other countries where small cars have always been used, the reasons why small sizes are still adhered to are based on numerous hard facts which are by no means uninstructive to Americans. A study of those reasons would very likely show convincing grounds for making our standard no higher than 40 tons.

## Discipline and Improvements.

The fact that lives and property are not so safe as they ought to be, on American railroads, is attributed, in part, to poor discipline or lack of discipline among the men who are put in charge of the lives and property. The question of making these men more careful, vigilant and efficient has been discussed a little, here and there, but definite results do not seem to be accomplished in any adequate degree. This being so it may be well to turn the problem around for a moment and look at the other way. If, instead of asserting that the discipline of trainmen and station men is defective or deficient (which seems to imply that it has deteriorated from some past standard or condition which was higher) we should assume that the trouble is due to changes in the demands that are made on the men, we might simplify our problem, or at least make it simple to more people. To tell a trainmaster or a foreman that his discipline is not so good as it once was, when he is all the time vividly conscious of having put forth just as much and as intelligent effort as ever before, is likely to puzzle and discourage him. This feeling should be taken into account, and if the diminished safety of lives or the increased expense on account of wrecks is due to increased burdens put upon the men, it will be well to be frank with ourselves and state the facts as they are. It is true that increased demands ought to be met by the men them-

selves. An intelligent man ought to grow with his work. Such increases in responsibility as have occurred have not been sudden, and wide-awake men have adapted themselves to new conditions. Nevertheless there is a duty to explain and educate which, it may be, has not been fully met.

Take the simple question of the frequency of trains. Assuming a given standard of intelligence and care, on the part of conductors, enginemen and operators, an increase in the number of trains daily will increase the liability of collision, *unless the degree of intelligence and care is 100 per cent.* in all the men. As long as our men are admittedly to be graded at less than 100 per cent. in proficiency and reliability, an increase of chances of collision means an increase in collisions. In the former times, supposed to be "good times" as compared with the recent periods of high casualty records, freedom from disaster was partly due to freedom from opportunity for disaster; it is so now; but there is less freedom because more opportunity. No one can measure this risk, or the change which has or may have occurred in it, but the fact will be acknowledged. Possibly this element, with the elements of overwork due to the great volume of traffic, and of inexperience due to the necessity of promoting men too fast and employing too many new ones, would account for most of the increase in the accident and damage record. Whether it does or does not, the point is one which, if reflected on, should serve as a reminder of the unwisdom of permitting expansion in business without providing for a corresponding expansion of facilities; and, in the matter of provision for safety, the facilities should be increased at least a little more than the demands increase, for our standards have never been high enough.

This using facilities up to their limit and beyond is a characteristic of railroad work in more than one department. The familiar experience with freight cars is an example. If we make stronger and better trucks, axles and wheels we forthwith increase the loads so that damage from broken parts keeps up as before; and with the heavier and more costly cars each damage bill is larger than its counterpart of former years. We introduce the air brake to make it safer to run at speed, and then increase the speed so that safety is perhaps diminished instead of increased. As soon as freight train speed is heightened so as to make it easier for the men to get adequate rest, we lengthen the runs so that irregular hours and overwork are as troublesome as ever. If the telephone is introduced to simplify communication by wire, almost the first thought of the superintendent is to try to save money on operators' wages—to get along with a cheaper grade of men. The need of skilful brakemen having become less pressing, with the almost universal use of the air brake, trains are manned with "trainmen" who not only lack skill in braking but also lack the all-around gumption which experience in braking formerly helped to teach.

Now, if we do the same way with the discipline of conductors, enginemen and operators, in those features of their work which come up for consideration when we study the collision record, we may fairly expect to go on killing people. Whatever may be said about the increase of chances or the proportion of killed to carried or employed, it is admitted that higher vigilance is required. No standard of efficiency is a safe guide except the standard of perfection. If the next Government bulletin—or the records of the next year—should show a diminution of 50 per cent. in the casualties to passengers, that fact by itself would not in the least weaken the grounds for the exhortations that have been made on this subject, or give any evidence that the deaths of the last appalling bulletin were unavoidable and conveyed no lesson. As long as trainmen neglect to identify opposing trains at meeting points, the investigation of their habits in this matter is a crying necessity, whether their neglect kills anybody or not. As long as conductors and enginemen are detected every month in depending on each other—instead of conferring with each other—for the safety of their train, discipline is in need of correction, whatever our death records may show or not show. The need for improving discipline is not to be learned now from the casualty records; but in the light of known deficiencies and known possibilities of improvement. The connection between a defect in discipline and the death of a passenger is often as hard to trace as that between a voter's conscience and an honest Mayor or a strong Congressman; but when everyone knows that the connection exists, the duty in the premises is plain.

## Clearance Limits on American Railroads.

On another page in this issue is a diagram showing the minimum composite clearance of the important railroads in the United States. Several points on the diagram are noteworthy as indicating a really serious condition of affairs brought about by the great increase in the size and capacity of passenger and freight equipment within the last few years. The increase has been gradual and the encroachments on what have been commonly assumed as safe limits of size have been made apparently without a careful study of the physical limitations of all of the railroads collectively.

The first projection shown on the line rising from the rail is 3 ft. 4 in. from the center line and rises 9 in. from the top of rail. Low arch-bar trucks are likely to strike the obstruction indicated, which is on a large railroad system in the middle West. The jagged line rising from 1 ft. above the rail is a composite of several Eastern roads, and comes very close to the bottom corner of the journal boxes on 5½ in. x 10 in. journals. If for any reason the size of wheels is decreased, as in the 120,000-lb. flat-car built for the General Electric Co. last year, and described in the *Railroad Gazette* Nov. 13, 1903, where it was necessary to get a very low floor, this point will strike the projections shown. The minimum width above 4 ft. is shown at 10 ft. While only one road reported this minimum width, several others are only an inch or two outside, and 10 ft. can well be taken as the limiting width. Several recent designs of furniture and other large cars, notably the coke car for the Cambria Steel Co., illustrated elsewhere in this issue, exceed this limit for the full height above the floor line.

The most serious condition, however, is indicated above the 11-ft. line. The irregular line from 11 ft. 6 in. up to 13 ft. 6 in. is the east-bound clearance limit for the Baltimore & Ohio. The diagram which was sent in from this road showed a composite clearance for the entire system plotted for east-bound and west-bound tracks. These clearances were originally obtained from a specially designed car built by the Baltimore & Ohio, which had mounted on it an apparatus for recording any projections within certain limits when the car was run through tunnels, bridges or past other structures to one side. (See the *Railroad Gazette*, May 1, 1903). The following note was appended to the print returned, showing the outline: "These clearances are obtained by subtracting the middle ordinate of a car 60 ft. center to center of trucks from the actual distance from the center line of track to the obstruction." In other words, where the obstruction was on a curve the clearances shown were rectified to provide for a car 60 ft. center to center of trucks passing around the curve where the overhang in the middle would apparently strike the projection. It is doubtful if any of the diagrams sent in were more carefully prepared than this one, which indicates the most serious difficulty. The proposed width at eaves for a standard box car is 9 ft. 7 in. at 12 ft. 6¾ in. above the rail. This width falls outside of the clearance shown. It has not been ascertained whether the clearance at this point is on the main line track or on a branch line, but inasmuch as two or three other roads come within 3 in. or 4 in. of the same point, it seems hardly safe to adopt as standard a dimension which interferes under the most favorable conditions with one great trunk line and so closely approaches the clearances of others. If the car is loaded eccentrically or rocks badly when heavily loaded, interference will result which might damage the car badly. Locomotives, perhaps, which are built to run on a certain division can be built as big as the clearances of that particular division will allow, but when a railroad orders cars which are to be used in interchange traffic, it assumes to a certain extent the responsibility for their safe operation. If the cars are too big to be run over another road, the responsibility rests with the owners of such equipment. It might be urged with equal force that if one railroad chooses to build cars which can be run over its own lines and not over some other line, it can equip such cars with air-brakes and couplers of some design which will not operate in connection with the equipment on foreign cars. The one proposition is as sound as the other, and yet the railroads are doing exactly that thing. Before any definite action is taken toward adopting a standard or maximum size of cars, such as the Master Car Builders' Association proposes to take, a careful and thorough examination of the clearances of all, and not a few, railroads should be made; and unless the minimum points can be changed before some agreed time, no encroachment on a safe limit for all the roads should be sanctioned.

The Secretary of the Board of Trade has issued for the year 1903 the "General Report," which follows the regular statistical report of accidents on the railroads of Great

Britain and Ireland. It is prepared by Herbert Jekyll. The statistical report was summarized in the *Railroad Gazette* of April 15, page 291. The present document contains the comments of the bureau officers on the principal facts of the year. The most noticeable feature this time is that part dealing with the form of the returns and proposing certain changes. Hereafter, each quarterly report will deal exclusively with the accidents of that quarter, as is the case in the American reports. Heretofore the English reports made up in July and October have given the figures for six months and nine months respectively. For 1903 the statistics of passengers, servants and other persons, are subdivided further than formerly and comparisons are drawn between the number of accidents and the corresponding number of persons exposed to accidents. It is proposed in the future to make a distinction between what are classed as preventable and non-preventable. It is also proposed to distinguish severe accidents (to employes) from those which are slight, those which lay a man off 14 days being classed as severe. The report declares that more than half the accidents which occur on railroads, either to passengers or employes, are due to want of common care and caution on the part of the injured persons. The inclusion of suicides and accidents to trespassers has led to much misapprehension and to false conclusions by many persons. Large as the totals have been, in the reports heretofore published, it remains true that, excluding the train accidents which cannot be cured by regulations, and those which are not caused by railway working, the field in which improvement is to be looked for is comparatively small. The number of passengers killed in train accidents in 1903 (25) is equal to one in 48 millions carried, the latter figure not including season ticket holders. The number killed is four times greater than in the preceding year, and the ratio is correspondingly greater, the number of passenger journeys having changed but slightly. The number of employes killed in train accidents (6) is equal to one in 12,106. The number of train accidents inquired into by the inspecting officers in 1903 was 31. Only five of these accidents were attended with fatal results to passengers. The number of accidents at highway grade crossings in 1903 was 100, in which 73 persons were killed and 39 injured. A list is given showing the place where each one of these happened and the circumstances in connection with some of them. The report has the usual condensed accounts of the inspecting officers' reports; these fill 11 pages.

The Railway Commission of Canada is giving the world an entirely new brand of state railroad regulation. After investigating an accident recently the commissioners ordered the suspension of the men whose negligence caused it, one for 30 days and another for 60; and in another case the man who was blamed was ordered dismissed. Just how fully the statute laws of Canada provide for punishment of men who, acting as railroad employees, cause death or personal injury we do not know; but if they deal with the subject at all, the interference of the Railway Commission will be likely, we should think, to introduce confusion. Even if the Commission's decisions are uniformly intelligent and just they will be subject to the grave objection that they relieve the railroad company of its responsibility in a way that must impair discipline and improperly favor the railroad. What right has the Commission to say that suspension is the most suitable punishment for the ordinary offenses? One of the first attributes of government is justice, but suspensions are usually unjust, in that they do not require the employee to pay the cost of repairing the damage that he has caused. They often do harm to the employee by enforcing idleness at an unsuitable time. The idle man often sows seeds of discontent in the minds of other employees. Suspensions have sometimes led to the employment of such a large number of "extra" men as to weaken the moralé of the forces. Usually the loss of wages sustained by the suspended man results in no benefit whatever to the company. These considerations have led many railroads to decide that suspensions are wholly wrong and to abolish them; so that if a railroad commission in the United States were to adopt this Canadian practice it would be ignoring the experience and defying the opinions of a large part of the community affected. In the matter of dismissals the authority that gives the order can often go wrong much more easily and surely than in suspensions; and the injustice, if there be any, is more palpable. As an example to the other employees a dismissal may entirely fail of its purpose. A dismissal which is made to take the place of a judicial prosecution impairs the majesty of the law. A railroad officer who dismisses a man to avoid the perplexities of administering exact justice neglects a public duty; and a Government officer who does the same thing is chargeable with the same offense.

The simplification of time-tables (by starting trains on the hour) which was introduced on the Philadelphia & Reading a year ago, with marked success, between New York and Philadelphia, has been applied now to the Washington trains as well as those for Philadelphia, and the same arrangement also appears in the time-table of the express trains of the Baltimore & Ohio between Washington and Baltimore. Express trains from New York for Washington start at 8, 10, 12, 2, 4 and 6; and those from Washington for New York start at 7, 9, 11, 1, 3 and 5. These departures from New York are on the same minute with the departure of expresses for Philadelphia (Reading Terminal), but the trains are in each case separate, leaving Jersey City one or two minutes apart. From Baltimore to Washington, and from Washington to Baltimore, express trains start every hour from 8 a. m. to 8 p. m., in each direction, with parlor cars on all trains. Where the traffic is large enough to justify it, this arrangement is a decided convenience, even though the speeds and the intermediate stops cannot be made entirely uniform, and there are other roads or divisions or short sections where such an improvement might be made. In the meantime the attractive even-hour scheme that was adopted on the New York division of the New York, New Haven & Hartford a dozen or 15 years ago seems to have been weakened a little of late; some trains are started at odd times, like 5:47 and 9:15. The remarkable even-hour scheme adopted on the Eastern Massachusetts lines of the New Haven road a dozen years ago for both through and local trains, and on both double track and single track lines, seems to be still in use, though with more variations than at first. This is not surprising; for it was surprising that such a rigid scheme worked as smoothly as it did.

A coal company owning and operating several hundred cars, most of them steel cars of 100,000 lbs. capacity, has been spending on an average $10 a month per car for wheel and axle renewals. This would seem to indicate that the cast-iron wheel is not altogether economical to use under cars in this kind of service at least. Practically the entire mileage which these cars make is over lines having heavy grades, and undoubtedly most of the trouble arises from the heating effect of the brake shoes. There is still a large proportion of old cars running in this service, and many of them are not equipped with air brakes. Quite a number are not equipped with air pipes. These cars are coupled into trains more or less promiscuously, and the result is that a few of the head end cars, usually steel hoppers, are depended upon to control the train. In descending even a light grade, heavy applications are made on these few cars and the heating at the wheel tread is just as severe as when descending a steep grade with all the air brake cars in the train coupled up. Ten braked cars and the engine will control a forty car train on light grades if the braking pressure is high, but twenty cars coupled up, and lighter applications of the air would control the train with greater safety and less damage to the wheels. It would take a little more time at terminals perhaps and use a little more air, but it would save a good many dollars on the wheel bill.

## NEW PUBLICATIONS.

*American Street Railway Investments.* Issued annually in connection with the *Street Railway Journal.* 362 pages, 9 x 13. Subscription, including the present "Red Book" and the Electric Railway Directory and Buyers' Manual, which is published three times a year, $5. The McGraw Publishing Company, 114 Liberty street, New York.

With this issue of the "Red Book," the publishers commence the second decade of the work, under conditions which, as suggested in the preface, are entirely different from those at the time the first volume was published. In 1894 very few street railway companies realized the importance of issuing annual financial statements, and many of them were opposed to the publication of such figures. At the present time the information given is of a very complete character. The street railway companies are arranged according to the alphabetical order of the cities and towns within the state where they have their headquarters, and the principal physical and corporate facts about the status of each company are given, together with information with regard to gross earnings, expenses, etc., for the majority of the companies, although this information has in some cases been withheld from the publishers. Many of the companies print their maps as well, and these show to great advantage on the large pages. A minor detail of considerable importance, which should be imitated in all statistical publications of this character, is the date of information, which is stated definitely at the end of each report.

## TRADE CATALOGUES.

*The Indianapolis Switch & Frog Company,* Springfield, Ohio, sends out a four-page folder with half-tones of various kinds of frogs, crossings, switches, rail-braces, etc. A leaflet is also issued by the same company describing the "Little Giant" switch stand. The novel feature of this switch stand is that the gear actuating the connecting arm of the target is four times the size of the pinion turning it. This confines the wear and tear to one-fourth of the gear, and, when this section is worn out, by readjusting the gear and pinion the other sections can be brought into use.

*The Chicago, Milwaukee & St. Paul* issues

a folder describing the Rosebud Indian Reservation. Under President Roosevelt's proclamation, United States registry land offices are to be opened on July 5 at Yankton, Chamberlain, Fairfax and Bonesteel, S. Dak., for the registration of applicants for these lands. The folder issued by the C., M. & S. P. gives a description of the various characteristics of the country as regards its climate, soil, products and topographical situation. It also has a map of the C., M. & St. P.'s line from Chicago to Yankton, which is the shortest line between these points. The folder contains a large amount of desirable information for any applicants for the new lands.

*The Nernst Lamp Company*, Pittsburg, Pa., issues a small book describing the value and utility of its lamp in the modern central station. This lamp is so designed that the maximum candle power can be obtained directly beneath the lamp, giving an economy of space and a lessening of the strain on the eyes. The need of reflectors is also obviated.

*F. H. Melville*, 192 Front street, New York, is sending out a circular describing a new kind of anti-rust. The circular announces that samples will be sent to any one who is interested in protecting bright steel from rusting.

*St. Louis Expanded Metal Fireproofing Co.*, St. Louis, Mo., has issued in pamphlet form tables for the design of reinforced concrete beams by Johnson's formulæ, as being more convenient for use than the diagram published by the company last year. Included in the pamphlet are the results of tests made at the Massachusetts Institute of Technology on the adhesion of different kinds of bars imbedded in concrete. This is reprinted from the *Railroad Gazette* of Sept. 18, 1903.

*The Empire Safety Tread Co.*, Brooklyn, N. Y., sends out a small catalogue illustrating and describing the application of carborundum safety treads to railroad and street car steps. The safety tread consists of a steel plate having narrow channels formed on its top surface and every other channel is filled with carborundum which it is practically impossible to wear out and which also gives a rough surface on which the foot will not slip.

*The Joseph Dixon Crucible Company*, Jersey City, N. J., publishes a booklet entitled "Graphite as a Lubricant," which discusses in detail the theory of graphite lubrication and its practical benefits. Of the various classes of machinery on which graphite is now used as a lubricant the more important are: Stationary engines and pumps, marine engines, gas engines, cylinders, ammonia compressors, air compressors, locomotives and air brakes.

*The Rand Drill Co.*, New York, is sending out a mailing card which is a decided novelty. It is in the shape of a new Imperial hammer, the address being written on the barrel and a one cent stamp fitting in the handle.

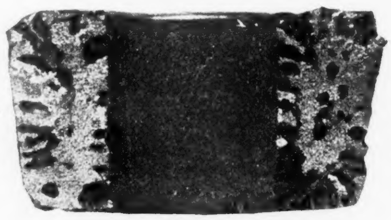
## CONTRIBUTIONS

### A Bad Coupler Casting.

St. Louis, Mo., June 11, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The accompanying photograph of the broken jaw of a coupler may be of interest to your readers. It is the outer half of the upper knuckle pin lug and was found lying alongside of the track. The car from which it came had run loaded to Kansas City and had came back in a long train, but the piece had been broken off by a pull with but one other car behind while switching in the yard after its safe trip of more than 500 miles. Neither the jaw nor the hinge pin of the knuckle are much worn, showing the coupler had not been in service very long. This is an interesting example of the kind of castings that are made and accepted by the railroads as couplers. On one side are 19 blow holes and on the other side are something over 30 holes. The edge next to the pinhole shows 11 perforations, giving an almost perfect "honey-comb" formation. If



**A Bad Coupler Casting.**

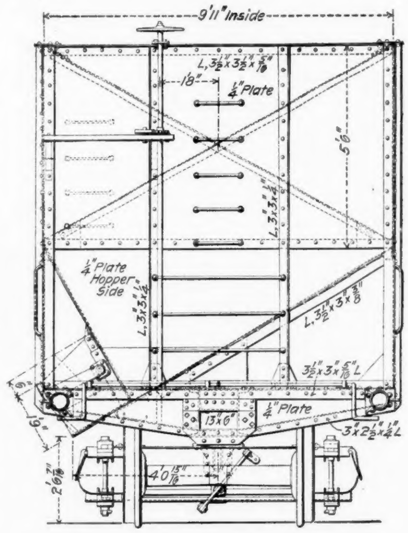
such a thing were not manifestly impossible, one might suppose them to have been bored with a drill. The surface of the casting is pitted with small blow holes and numerous cold-shuts indicating a structure throughout very similar in appearance to the fracture. Not more than 60 per cent. of the area of the fracture is solid metal and that is crystalline. How any conscientious inspector could ever accept a casting which gave such evident surface indications of poor quality is hard to understand. If more care was taken in selecting only sound castings from reputable makers, the railroads would possibly have less trouble from break-in-twos and coupler failures. S. D. W.

### Coke Car for the Cambria Steel Company.

The Cambria Steel Company, Johnstown, Pa., has built for its own use a number of steel hopper coke cars of unusual dimensions and design. They are intended to haul coke from the coke ovens near Franklin, Pa., to the new blast furnaces now under erection at the company's plant at that point. The cars have a marked capacity of 100,000 lbs., and a cubic capacity of 3,852 cu. ft., heaped. They are divided by the sloping floor sheets into eight pyramidal hoppers, from each of which a chute leads out to one side of the car only. These side chutes are spaced on centers the same distance apart as the two skip buckets of the furnace elevator. When the car is placed in position opposite the furnace, one chute is opened and the contents of its hopper is discharged into the skip bucket below. As this bucket is raised to the charging platform of the furnace the other bucket descends under the second chute and is loaded and raised. The car is then moved along until the third and fourth chutes are over the skip buckets, and these in turn are allowed to discharge their contents. Four shifts of the car are required to unload it, but as the coke falls directly into the furnace elevators, no handling of the coke at the furnace is necessary.

The cars are 48 ft. long inside, 9 ft. 11 in. wide inside, and 13 ft. 3 in. high from top of rail to top of side. On account of the extreme length and the manner in which the floor and sides are broken up by the hoppers, the design calls for substantial lateral body bracing and longitudinal frame bracing. The center sills are 15 in. 33-lb. channels, spaced 13 in. apart, with the flanges turned out and covered with top and bottom cover plates. The side sill has been omitted on the side carrying the discharge chutes, but on the opposite side a 9-in., 13¼-lb. channel is used between bolsters and a 7-in., 9¾-lb. channel between the bolster and the end sill. The bolsters, end sills and single cross-tie in the middle of the car, are built up of plates and angles. The side stakes on the side opposite the chutes are carried down to the light side sill, but on the side having the chutes, only the stakes at the bolsters and the middle cross-tie are carried down below the vertical plates of the sides. Light angles, 3-in. x 3-in. x ¼-in., are carried across from the center sills to the side sill on the back side of the car, one under the middle of each hopper. A triangular plate, set on edge, rests on top of the center sills under the middle of each hopper, and supports the slope sheet which is further stiffened against sagging by a 3-in x 3-in. x ⅜-in. angle riveted along the under side from the center line of the car up to the top edge of the sheet. The lateral bracing in the upper part of the car consists of cross-diagonals of light angles at every other panel point, and a 4-in. x 4-in. x ½-in. angle tie across the top of the sides. Cross bending strains in the under frame are taken care of by angle braces running back from the side sills on the back side of the car, to the center sills at the bolster and middle cross-tie. A 10-in., 25-lb. channel is used for the end sill diagonal braces between the outer ends of the bolster and the middle of the end sill.

The discharge chutes have an opening at the mouth 2 ft. 6 in. wide, and 2 ft. 3 in. high. The steep slope sheet of the hopper is cut away to this size, and there is no door, the load being held in the open chutes by the prong rakes at the outer end of the chute. These prongs are fastened to a cross-piece at the top, which is pivoted on two

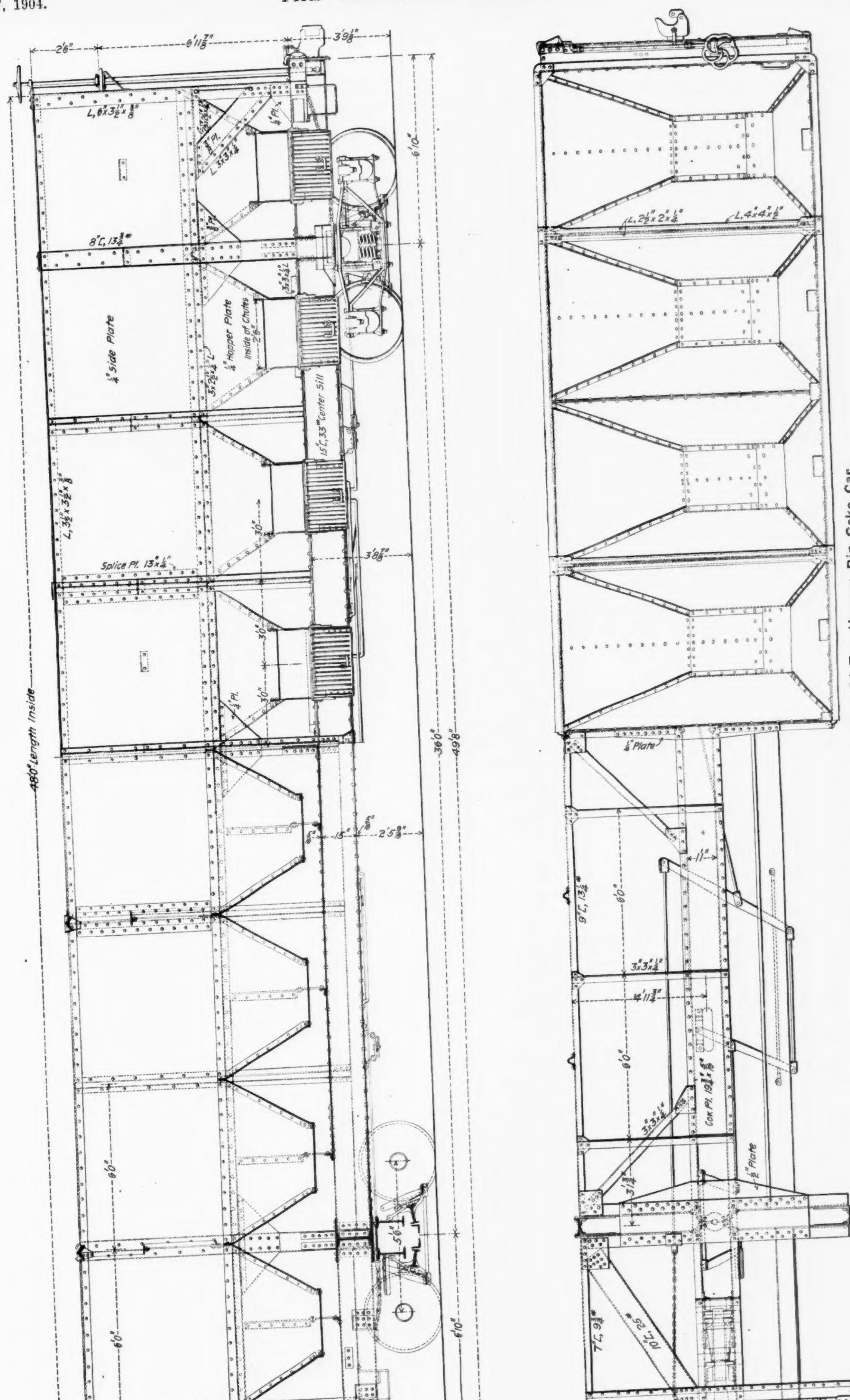



**End Elevation of Cambria Coke Car.**

arms running back to brackets on the hopper sheet. A handle fastened to the prongs serves to raise the rake up above the chute and allow the load to discharge and to lower it when the discharge is to be stopped. The prongs can be forced down through the stream of coke with less trouble than a solid door could be closed.

These cars are mounted on Cambria arch-bar trucks of 100,000 lbs. capacity, and their light weight is 55,400 lbs.

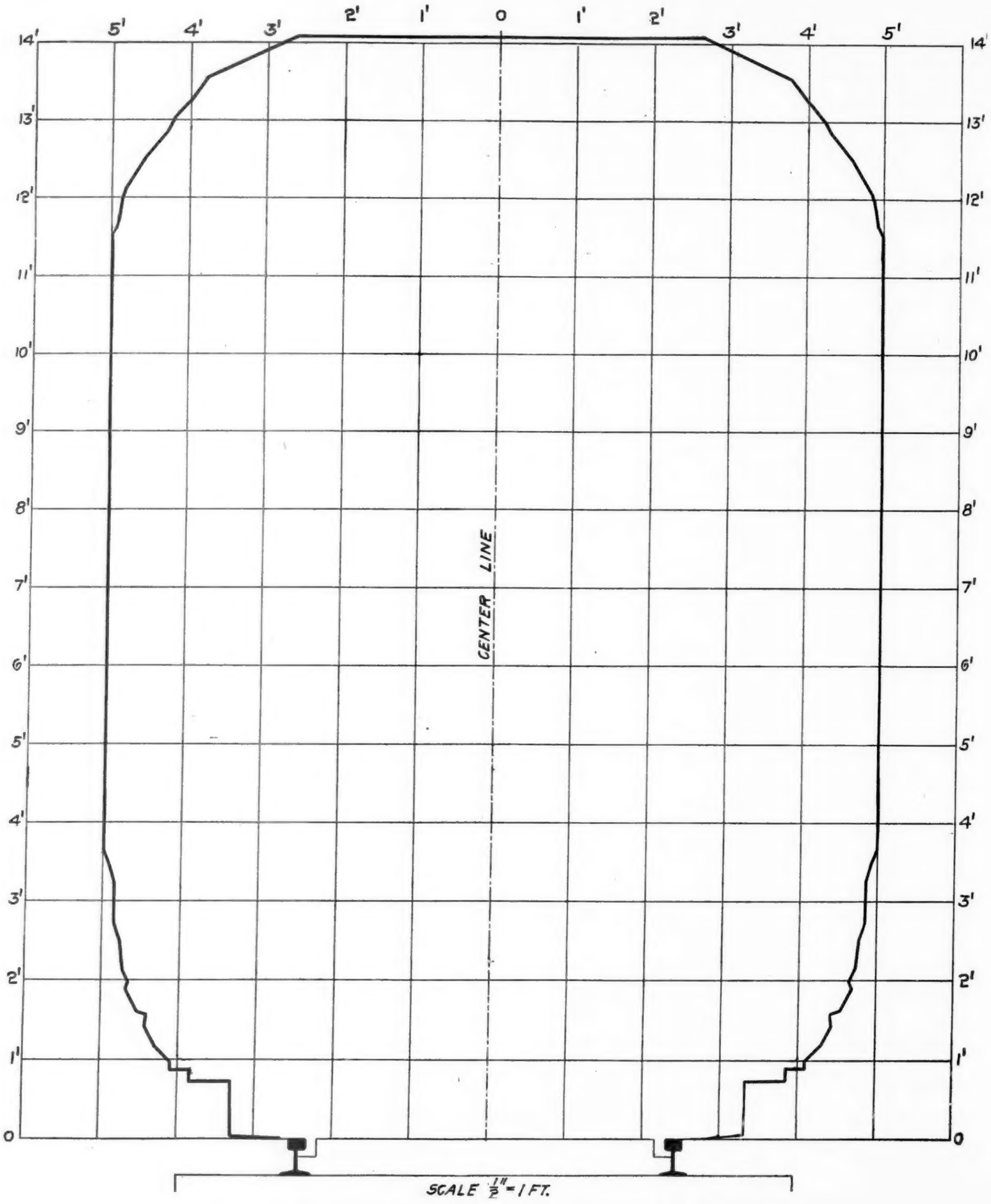
We are indebted to Mr. H. H. Weaver, assistant to general manager, Cambria Steel Company, for the drawings.




Plan and Side Elevation of Cambria 50-Ton Hopper Bin Coke Car.

## Clearance Limits on American Railroads.

In 1902, a committee of the Master Car Builders' Association recommended certain outside dimensions for box cars to be adopted as standard and again in 1903 these dimensions were recommended but no definite action was taken, the committee being continued for another year to make a complete report on a design of standard box car and its detail construction. The outside dimensions presented in 1902 permitted the use of the standard inside dimensions previously adopted by the American Railway Association, and the committee stated in its report that cars built in accordance with them would be safe to run on any of the larger railroad systems. The width at eaves was fixed at 9 ft. 7 in. for cars with both low and high floors corresponding with a height at eaves from top of rail, of 12 ft. ¾ in. and 12 ft. 6¾ in., respectively. Most of the box cars built since the adoption by the American Railway Association of 8 ft. width and 8 ft. 6 in. height as standard, have conformed to these dimensions and come inside the suggested outside dimensions, but there seems to have been no limit set to the size of furniture, buggy, barrel rack, coke, and other cars for special service. So long as these cars are run in a certain well defined district where the clearance limits are well out, they are just as safe to run as the smaller car but if such a car is loaded to some point on a foreign road and is refused at the interchange point as unsafe to run over the connecting road, expensive delays occur in trans-shipment of the lading to a smaller car. No car which is used in interstate traffic and which may at any time leave the home road should exceed certain outside dimensions limited by the clearances of all the roads of any importance over which there is any likelihood of the car's being routed. Contract car builders are often at a loss to know how far they can exceed certain commonly assumed dimensions in designing cars for special service and still build a car that is safe to run anywhere. A composite clearance diagram compiled from all of the important railroads would be of much value to them in such work and to the railroad mechanical departments as well. With this end in view the accompanying diagram was prepared. A letter was sent to the chief engineers of more than 50 of the largest railroads in the country asking them to indicate on an enclosed blue print the clearance limits of their roads. They were asked, for the sake of uniformity, to indicate only the actual striking contours of the bridges, tunnels, station platforms and other structures and not to show working clearances or outline clearances of equipment running over their roads. Replies were received from more than 40 roads, and




Composite Clearance Limit Diagram of Railroads in the United States.

with the data in hand, each clearance outline was carefully plotted on one sheet, making a composite diagram for all. The inside line was taken as indicating the minimum clearance and this line is shown on the engraving. A number of the replies showed outline clearances for equipment but these were all thrown out and all doubtful points on any of the others were carefully checked or rejected entirely. It is believed that the engraving, which is on a scale of ½ in. to 1 ft., represents as accurately as is possible, the minimum composite clearance for American railroads. Comment will be found in the editorial columns.

## Notes from the Southern Railway Shops at Manchester, Va.

The principal shops for the northern section of the Southern are at Manchester, Va., on the James River, opposite Richmond. They cover 12 acres and give employment to about 700 men. They include both the locomotive and car departments. The shops are not interesting in so far as design and arrangement are concerned. The shops, like Topsy, have "just growed." At one end of the yard is the brick paint shop. When a concrete floor was laid the gutters between the tracks were carried to the end of the building and made to drip into a sewer on the outside at either end. Such an arrangement would be impossible in a cold climate. The shop is heated from a quadruple line of steam pipe sunk into the concrete in the

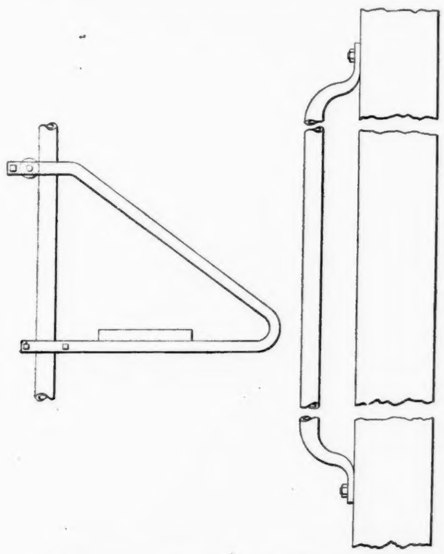


Fig. 1—Paint Shop Scaffolding.

center of each line of track. The object of this is to heat the air beneath the car that is being painted and cause a warm dry stream to flow out and up the sides and thus facilitate the drying.

The paint shop scaffolding is adjustable in height and is carried by swinging brackets like those shown in Fig. 1. These slide up and down gas pipe uprights held to the supporting posts of the roof. The boards are fitted with hooks that lay over the brackets and hold them in position while they are being raised and lowered. The method of working is to raise it for use on the letterboard drop to the proper position for the window posts and then raise it up out of the workman's way when the paneling is being covered. This form of scaffolding has supplanted that previously used, which consisted of a 4½ in. pipe driven into the ground containing a plunger beneath which water under pressure was admitted to raise and hold the scaffolding at any desired height. This form is shown in section in Fig. 2. When these lifts were in use it was considered that they effected a great saving in time in varnishing besides being high enough to be used by the tinners.

The time required to paint a car is about 14 days, although the facilities are such that it can be rushed through in nine days. The sequence followed is first to burn off with a Vulcan torch and scrape. This scraping, which was previously done with a putty knife, is now done with an

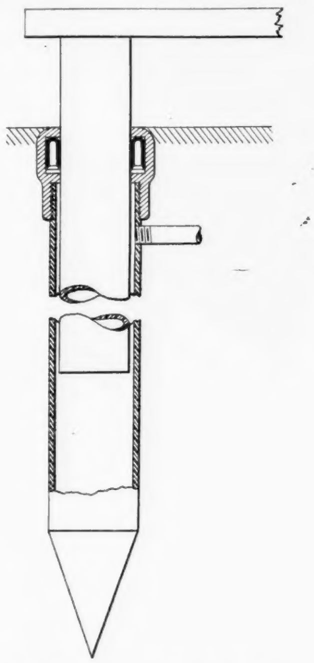


Fig. 2—Hydraulic Lift for Scaffold.

old file bent and sharpened, and the work can be done much more thoroughly and quickly. After burning and scraping the car is sandpapered and given an A coat, then one coat of No. 2, then one coat of glaze after which two coats of No. 3 follow when the car is rubbed down. Then come two coats of color and two coats of finishing varnish. The varnish is allowed to dry for a day and two nights. It is the practice to sand the ends of the baggage, express and postal cars in order to protect them from cinders. This work is done with a sander shown in Fig. 3, which consists of a small tin can fastened to the top of a piece of ½ in. gas pipe, and provided with a broad flat nozzle that has an opening of about $^1/_{16}$ in. Compressed air is admitted to the pipe and projects the sand against the car. The sanding can be done in this way in about one-third the time required to do it by hand and with a saving in the amount of sand used. The paints are stirred in their tanks by means of compressed air. This method has been criticised but inquiry at Manchester develops the fact that the paint is not oxidized nor is water deposited.

One of the handy adjuncts of the paint shop is a spraying car used for outside work on freight cars. It is carried on four wheels and between them is a cupboard for the storage of materials and the spraying machine; while, at the ends there is a swinging bracket and shelf so that the total length of the car is equal to that of a box car. It can serve as a traveling scaffold. It moves on a narrow gage track between the main repair or paint tracks and does away with all need of the use of horses and planking. Difficulty has been experienced in getting men to work with the paint sprayer on account of the fine particles which fill the air. Respirators have been used but apparently do little good. The color is well laid, and with the machine a man can paint a box car, including the roof, in 36 minutes.

For many years the road has done all of its own silver and nickel plating and silvering mirrors and etching fancy glass. The silvering of the mirrors is done in the usual manner by pouring a solution of nitrate of silver, Rochelle salts, ammonia and potassium hydrate over the glass that is laid upon a warm cement table, and then draining the water into a gutter at the side. The table has a deep bottom upon which is laid a coil of steam pipe bedded in about 4 in. of sand. The cement top is spread over the sand. This construction insures an even heat beneath the whole surface of the glass. The cement table is also used for chipping glass; that is, for producing the cracked or frosted effect that is worked into deck lights of passenger cars, etc. The glass is first sand blasted to roughen the surface so that glue will adhere. The pattern that it is desired to produce having thus been cut, a coating of glue is spread over it and the glass placed in front of a steam radiator to dry. The rapid drying of the glue draws on the glass and gives the crinkling effect. There is no control over the actual form of the crinkling, but it may be made light or heavy

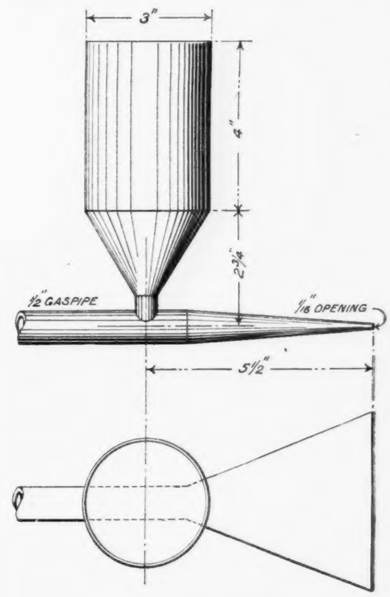



Fig. 3—Sander.

according to the application of the glue. Etching with hydrofluoric acid is also done and produces fine frosted effects. A pattern is drawn or printed on the glass. An ordinary method of doing this printing is to give the glass a coat of paint and while it is still wet, the pattern is placed over it and the glass is set in the sun. The unprotected part soon dries and the pattern is removed and the undried paint readily washed away. This leaves the pattern worked out on the clear glass, which is then covered with acid. An example of this method of etching is shown in Fig. 4, which was obtained by laying the lace on the wet paint. The ordinary patterns that are used for this work are zinc. The water used in the washing-off processes is purified by a small filter and still. The trays used are wood with a thick coating of paraffine on the inside. The zinc patterns are made by coating a sheet of zinc

with a layer of asphaltum or paint, and when this has dried the outline of the pattern or letter is cut through the paint with a scriber. The plate is then given a bath of hydrochloric acid and the metal is eaten through and the stencil finished. The waste hydrochloric acid, which has dissolved some zinc, is then turned over to the tinners for use in soldering so that there is no loss. On all glass decorations there is a material saving. In plating headlight reflectors the price paid to outside parties for the work was $2.50, while the cost under present conditions is 78 cents. An elevator serves the glass decorating room. A horizontal cylinder with its piston attached to a multiplying drum does the hoisting. Power is furnished by compressed air that is admitted to the top of a tank forcing water out through a small pipe into the cylinder. In this way a very steady motion and one entirely free from jumping or jerking is obtained.

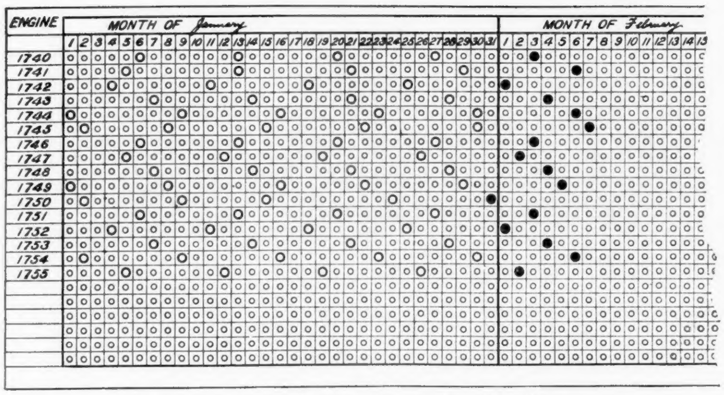



Fig. 5—Record Board for Boiler Washings.

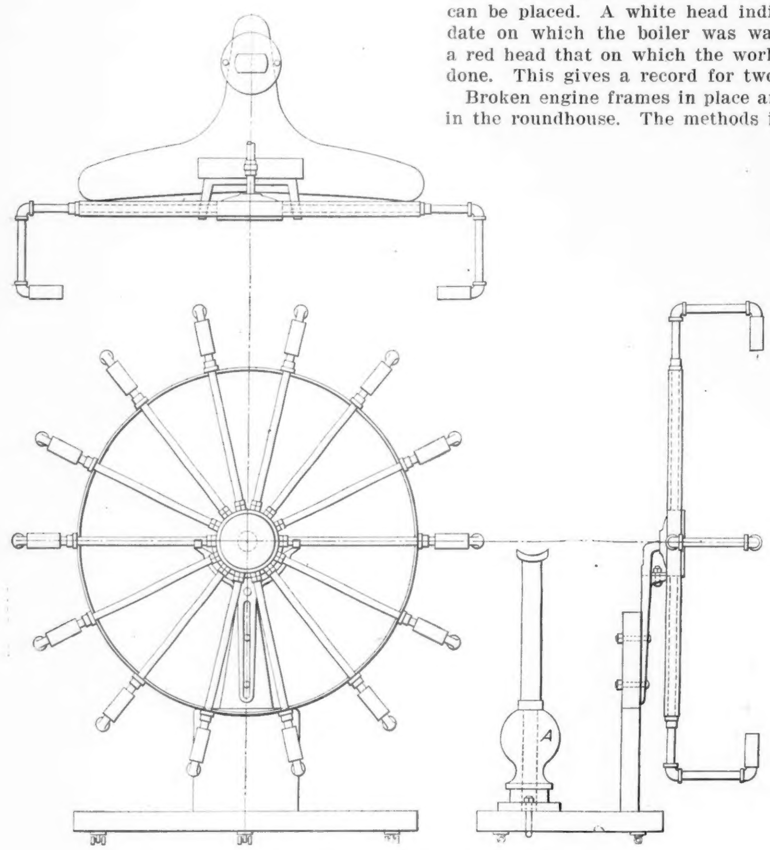



Fig. 7—Gasoline Tire-Heater.

Engines are fired with a Bristol fire kindler using crude oil. This consists of a crude-oil tank, a sprayer and a connection to the supply of compressed air which should be delivered under a pressure of about 90 lbs. per sq. in. It requires from 3½ to 4 cents worth of crude oil to light a fire, and it takes from 35 minutes to 1½ hours to start the fire.

Many of the engines are small for the work required and the exhaust nozzles are small. At the end of each trip the flues are blown out with an air blast. Boilers are washed out about once a week and a record kept in the roundhouse on a board shown in Fig. 5. At the left and permanently fixed is a column in which are the numbers of the engines running into the roundhouse. The remainder of the space is filled by two sliding boards with 31 columns, one for each day of the month. These columns are provided with holes in which a button-head pin can be placed. A white head indicates the date on which the boiler was washed and a red head that on which the work is to be done. This gives a record for two months.

Broken engine frames in place are welded in the roundhouse. The methods in use on the New York Central and the Baltimore & Ohio have already been described in the *Railroad Gazette*, Feb. 27 and May 15, 1903. On those roads oil is burned as a fuel. Here a coke fire is used and a filling piece about ¾ in. thick is put in the break which is jacked apart to receive it. The fire is held

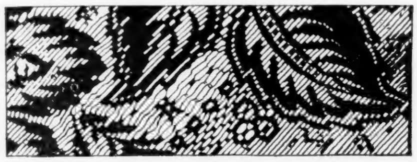


Fig. 4—Lace Etched on Glass.

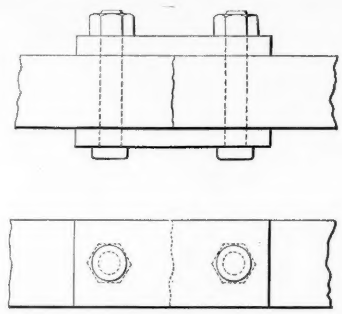


Fig. 6—Engine Frame Splice.

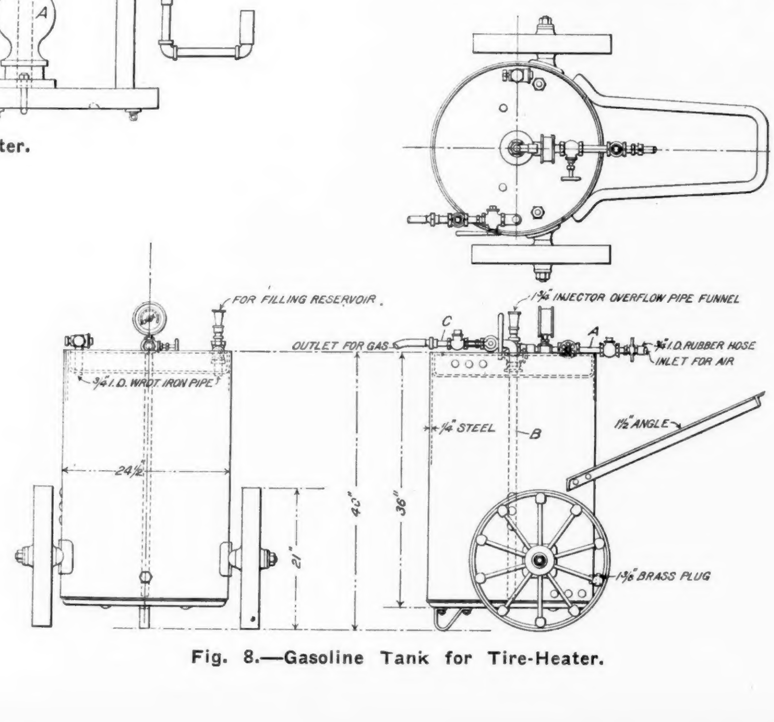



Fig. 8.—Gasoline Tank for Tire-Heater.

in a pan beneath the part to be heated and is blown with a blast of compressed air. Before the heating is commenced all of the fastenings back of the fracture are cast loose, and when the proper temperature has been reached, the parts are driven together by blows with a ram on the back end of the frame. At the same time hammer blows are dealt at the point of the weld. An allowance of about $^5/_{16}$ in. more than the proper traming distance between points on either side of the weld is left for contraction or cooling. Broken upper rails are frequently repaired with a splice, as shown in Fig. 6. Two holes each $1\frac{3}{8}$ in. diameter in the solid metal are drilled on each side of the crack. Two plates as heavy as can be placed alongside the frame are cut and drilled to fit, the distance between the holes being somewhat less than that between the holes in the frame. These plates are then heated and expanded until the holes come flush with those in the frame. The frames are then secured by bolts. The contraction of the splicing plates draws the frames together.

A tire heater recently made consists of a wheel of gasoline burners at the end of pipes, each of which is furnished with a slip joint. The tire is suspended from a crane and the burners adjusted so that they stand about an inch from it. A gasoline tank with a compressed air pipe leading thereto completes the equipment. The heater is shown in Fig. 7 and the tank in Fig. 8. The former is attached to a bracket supported on a small platform carried by three wheels. The weight at the back marked "A" is to counterbalance the overhang of the burner. The burner is shown in Fig. 9. A piece of brass pipe "B" is screwed into the center casting, shown in detail in Fig. 10, and this pipe is provided with a packing box and collar for a thumb screw to hold the telescope pipe, which is also brass. Beyond the telescope pipe the connection is $\frac{1}{2}$ in. gas pipe ending in a gooseneck and a piece of $1\frac{1}{4}$ in. iron pipe, with six holes $^3/_{32}$ in. in diameter drilled in it to form a Bunsen burner. The gasoline tank is $\frac{1}{4}$ in. steel, 24 in. inside diameter and 36 in. long over all. It is filled through a funnel opening at the top. When in operation, compressed air is admitted through the pipe "A" and regulated by the pressure gage. The air passes down through the pipe "B" in the interior of the tank to a point near the bottom and then bubbles up. In doing so it becomes charged with gasoline and issues as an inflammable gas.

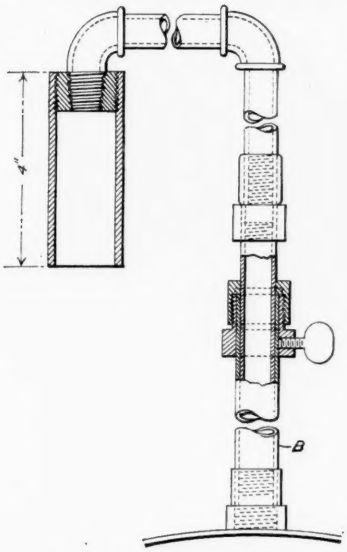



Fig. 9—Tire-Heater Burner.

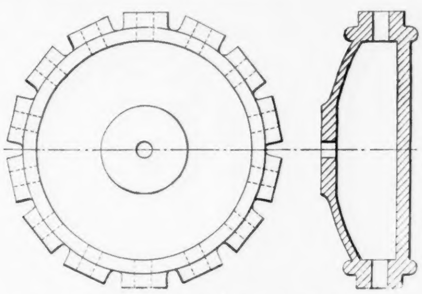


Fig. 10—Center Casting for Tire-Heater.

In the car shops there is a traveling air hoist suspended from an overhead trolley. This trolley has a switch (Fig. 11) which locks in any position. The switch rail "A" is held by the bar "B," which has two notches cut in the upper edge to engage the latch "C," by which it is locked at either end. This latch "C" has a width double that of the bar "B" and is raised and lowered by the slide "D" attached to the operating lever "E." This slide has a slot working over a pin "D," so that it can move in either direction to lift the latch before engaging if any further movement carries the switch rail with it. At the end of the throw the latch drops into the other notch and the rail is locked.

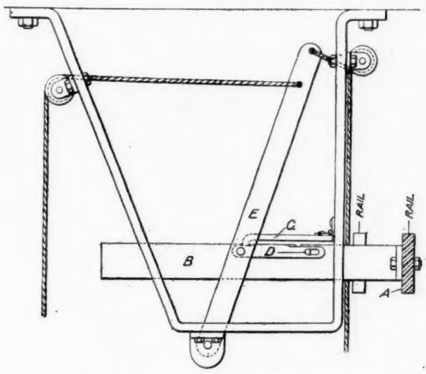



Fig. 11—Overhead Trolley Switch.

Safe and strong lumber tongs is shown in Fig. 12. Instead of lifting direct from the pivotal point of the tongs and trusting to the weight of timber to tighten the jaws, the pivot pin slides in a slot in the lifting stand "A" and the upward pull is transmitted to the legs by connections which thus have a tendency to pinch the stick.

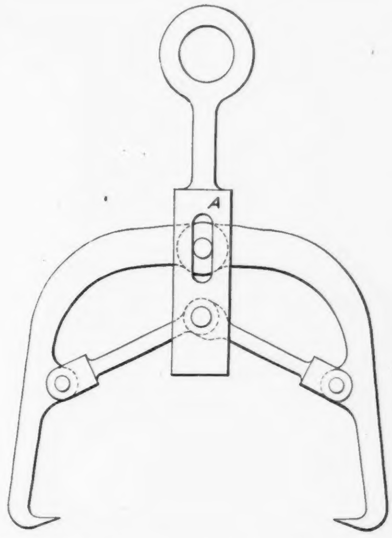



Fig. 12—Lumber Tongs.

A tool used for reaming angle-cock plugs is shown in Fig. 13. It consists of a cast-iron shell "A," having a lug upon one side for holding in a vise. One-quarter of the case is cut away and to one of the faces thus formed the cutter "B" is fastened by machine screws so that it can be adjusted by the screws "C." The reamer is dropped down into the opening and the cutter "B" is adjusted. The angle cock plug is then dropped down into the opening and while it is turned from below it is forced down by the cap "D," which is screwed down over the upwardly projecting threaded portion of the casing.

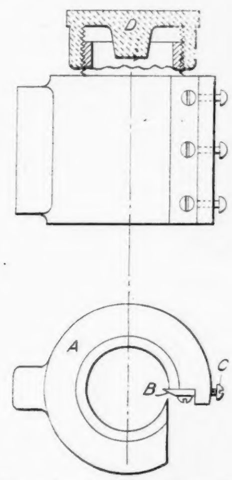



Fig. 13.—Angle-Cock Plug Reamer.

A jig for babbitting cross-heads so that they will require no planing is shown in Fig. 14. The cross-head is set down with its piston-rod socket over a boss projecting up from the bottom of the jig. Adjusting screws "AA" are run in from the sides to steady the cross-head and the sides of the jaws are set to the exact distance between the guides. The metal is then poured in a

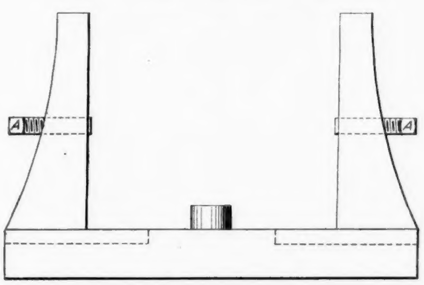



Fig. 14—Jig for Babbitting Crossheads.

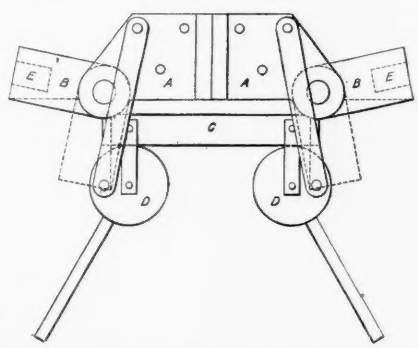



Fig. 15.—Machine for Turning Flat Bar Gibs.

mould of the same size as the guides. The foundry turns out from 600,000 to 700,000 lbs. of castings monthly which are shipped to the other shops of the company at Alexandria, Columbia, Lawrenceville, Knoxville and Charleston. The cost of the castings is from 1.23 cents to 1.4 cents per pound. The moulders are paid by the piece and a good deal of the work is done on moulding machines. It has been found that a stronger shoe can be cast with less failures if inserts are put in lengthwise instead of across the casting. Burnt foundry sand is sold at 25 cents per ton to brickmakers who use it for facing molds. All brass castings are melted in a cupola having a capacity of about 12,000 lbs. The fuel consumption is 1:9 to 1:10, while that for ordinary crucible work is about 1:7. Coke is used and the cupola is charged the same as an iron cupola. The blast is from 8 oz. to 10 oz. As an example of the economy of the cupola, there was an accumulation of skimmings which were to be sold to a dealer. It occurred to the Master Mechanic to run them through the cupola with the result that 7,000 lbs. of brass was recovered.

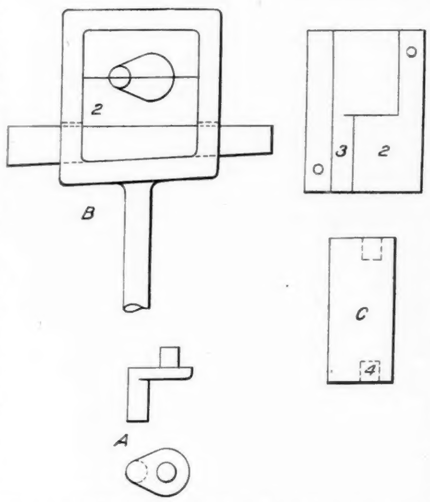



Fig. 16—Die for Forging Clips for Wagner Doors.

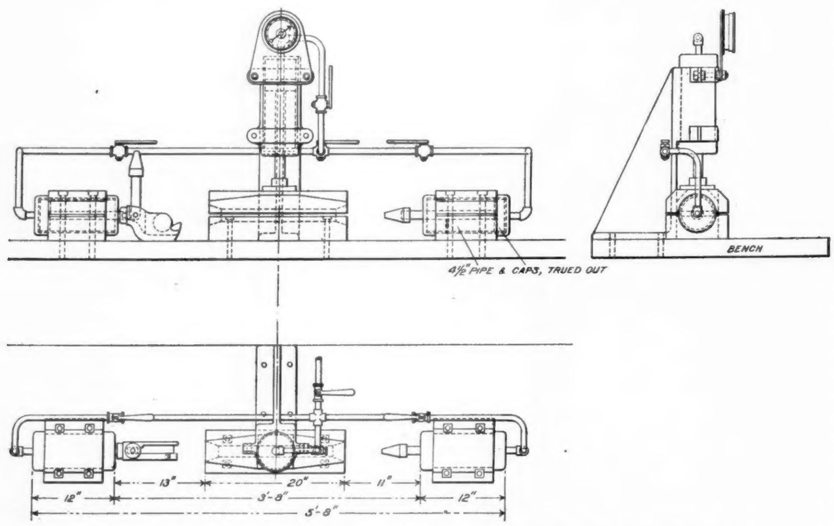



Fig. 17—Machine for Applying Couplings and Nipples to Air Brake Hose.

A blacksmith shop tool used to turn a gib on a bar of flat iron is shown in Fig. 15. It is attached to a heavy flattening table 3 in. thick, its base consisting of two castings "AA" to which the bending dies "BB" are pivoted. The bar to be bent is slipped in between the main casting "AA," and the movable jaw "C" which is brought down and clamps it in position by the eccentrics "DD." When this is done the dies "BB" are turned into the dotted position by the bars thrust into the pockets "EE."

A tool for forging the clips of the Wagner door is shown in Fig. 16. The device accomplishes the work of the drop or forging press with the aid of the ordinary steam or power hammer. The clip is shown at "A," and the die ready for work is shown at "B." It consists of two halves 1 and 2 held in a rectangular frame by an ordinary tapered key. A side elevation of the flat side of the die is shown at the right. A plunger "C" is made to fit in the opening of the dies and is itself fitted with an upward projecting hole, shown by dotted lines to form the small teat on the clip. A piece of round iron to make the clip is heated to a white heat and dropped into the opening in the dies. The plunger "C" is then set in on top of it and driven down by the hammer. In this way the metal is caused to flow down into the hole 3 of the die and up into 4 of the plunger, thus forming the clip, which is taken out by knocking out the key and removing the dies.

The machine used for applying couplings and nipples to hose is shown in Fig. 17. There are three air cylinders attached to the machine, each of which is operated separately. The vertical cylinder operates the upper jaw of the clamp to which its piston rod is directly attached. The right-hand horizontal cylinder is used to carry and push the nipple into place and the left-hand cylinder the coupling. The piston rod is fitted with a dummy for holding the coupling while the work is being done. Air is admitted to each cylinder by a separate plug cock with a leak hole so that when closed the air in the cylinder leaks off. The cylinders are made of 4½ in. gas pipe and are held in position by clamps tightened by bolts. These clamps are wood. The smooth interior surfaces of the air cylinders are obtained by tumbling nuts and scrap in the interior of the pipe.

The standard form of eccentric straps is shown in Fig. 18. The body is an I-section which gives strength, lightness and a surface for radiating heat. The wearing surface is lined with babbitt and the two parts are bolted together with 1¼ in. bolts. Oil cups are cast in the top. The strap is complete in itself and has been found satisfactory.

## Steel Car Design.

BY A. STUCKI.

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While the Master Car Builders' Association has done much towards standardizing certain details of car construction, little has been done along the line of adopting uniform requirements for the strength of the elementary parts, the sills, bolsters and body framing. Car builders differ widely in opinion as to whether in certain cases, concentrated, uniformly distributed or partial loads should be assumed in calculating the strength of members in the framing; whether or not the same percentage for impact should be allowed in all cases; what end shocks should be provided for; the safe working stresses for materials used in car

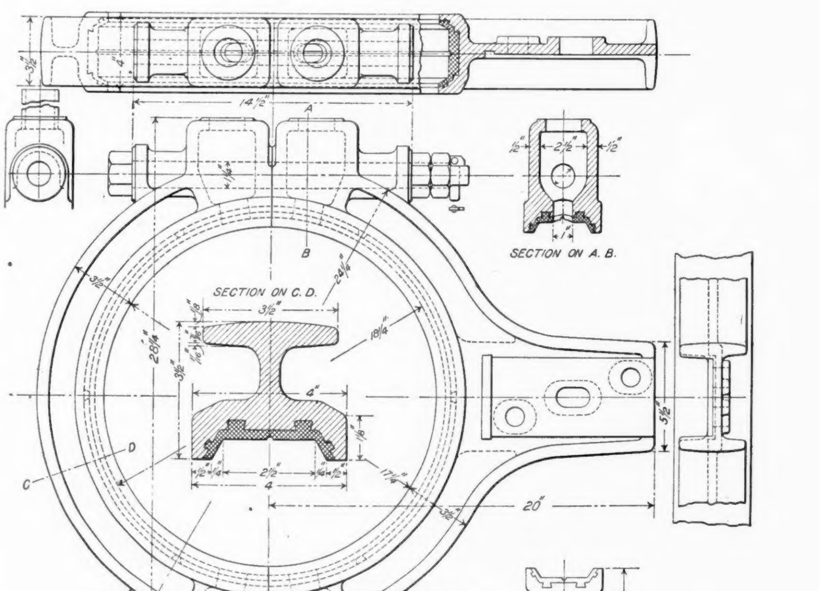



Fig. 18—Standard Eccentric Strap—Southern Railway.

building. The following extracts from the writer's notebook are not intended as a complete and absolutely accurate analysis of the stresses in steel cars. They are the result of several years' work in designing and building cars and are based largely on average conditions as found in service, supplemented with much valuable data from the testing room. Such assumptions as have been made have been verified in practice and are believed to be sufficiently accurate for the purpose of designing.

*The Arch-Bar Truck.*—The four-wheel, arch-bar truck is more generally used under freight equipment in the United States than any other type. A truck should be made strong enough to carry half the marked carrying capacity of the car with 10 per cent. allowed for over load, plus half the weight of the car body. Since the trucks may be interchanged and put under other cars of equal capacity, the heaviest car bodies should always be considered. The weights of car bodies can be taken at 20,000 lbs. for 60,000-lb. cars, 23,000 lbs. for 80,000-lb. cars, 26,000 lbs. for 100,000-lb. cars. The allowable loadings on track, bridges and other structures vary greatly on different railroads, but ordinarily it is safe to assume for the purpose of designing that the weight per running foot of track should not exceed 5,000 lbs. The maximum allowable limit of 45,000 lbs. per pair of wheels is never reached in car construction.

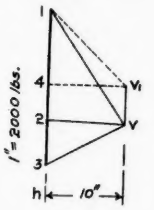
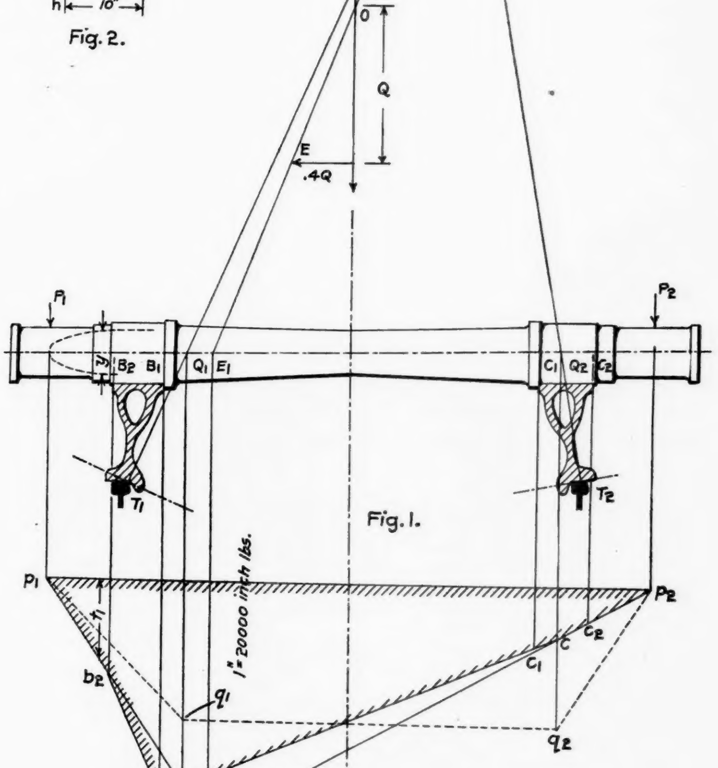



Fig. 2.

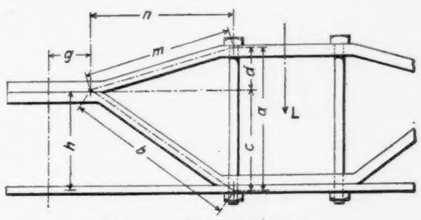



Graphical Analysis of Stresses in Axles.

*The Axle.*—The axle may be designed graphically by the following method: (Figs. 1 and 2.) Q being the load coming on one axle, the horizontal force due to centrifugal forces and the swaying of cars on curves can be assumed as .4Q. This includes the benefit derived by elevating the outer rail and is the result of experiments made under ordinary conditions of track at the highest safe speeds. The point O is the center of gravity of the car and load. Draw the resultant OE of the horizontal force .4Q and the vertical force Q and extend it beyond $O_1$. From the rail-head $T_2$, draw $T_2O_1$ at right angles to the coning on the wheel tread and connect $O_1$ with $T_1$, the other rail-head. Drop perpendiculars from $E_1$, $Q_1$ and $Q_2$, the intersections between the center line of the axle and the lines $O_1E$, $O_1T_1$ and $O_1T_2$. Lay off on Fig. 2 the vertical line 1-3 on any convenient scale, preferably 1 in. = 2,000 lbs., of such length that it represents to scale, the vertical load Q. Locate the point v horizontally, 10 in. to the right of the line 1-3 and vertically about ⅓ or ¼ of its height from the bottom. Connect 1 with v. On Fig. 1 drop perpendiculars from $P_1$ and $P_2$, the centers of the journals to $p_1$ and $p_2$. Draw a line from $p_1$, parallel to 1-v (Fig. 2) until it intersects at $e_1$ a perpendicular dropped from $E_1$. Connect 3 with v (Fig. 2) and draw $e_1$-$p_2$ parallel to 3-v. Connect $p_1$ and $p_2$ and draw v-2 (Fig. 2) parallel to it. Line 1-2 now represents to scale the load at $P_1$ and 2-3 represents the load at $P_2$. Drop perpendiculars from the hub faces of the wheels until they intersect the lines $p_1e_1$ and $p_2e_1$ (Fig. 1). Draw cb and extend it to $b_1$. Connect $b_1$ with $b_2$ and connect $c_1$ with $c_2$. The link polygon $p_1b_2b_1c_1c_2p_2$ gives the moment diagram for the assumed loading and the length of any perpendicular included in the shaded portion of the figure corresponds to the moment in inch-pounds of the corresponding section of the axle. The moment diagram is on a scale of 20,000 in.-lbs. = 1 in., since the scale of pounds was assumed at 2,000 lbs. = 1 in. and the point v was taken 10 in. to the right of the line 1-3 (Fig. 2). For example, the line $t_1$ measures 7.75 in. which, multiplied by 20,000 gives 155,000 in.-lbs. as the moment of the section at y.

In order to find the bending moments in the axle if the centrifugal forces are disregarded, move v (Fig. 2) vertically upward to $v_1$, so that a line drawn from 4, half-way between 1 and 3, and parallel to 2-v, will pass through it. Connect 1 with $v_1$ and draw a line parallel to it from $p_1$ (Fig. 1) until it intersects the perpendicular dropped from $Q_1$ at $q_1$. From $q_1$ draw a line parallel to 4-$v_1$ or 2-v until it intersects the perpendicular dropped from $Q_2$ at $q_2$. The vertical distance between the lines $p_1$-$p_2$ and $q_1$-$q_2$ represent the moments for the shank of the axle.

Having determined the bending moments graphically throughout the length of the axle it is not difficult to obtain the diameter at any point.




Stresses in Arch-Bars.

Let M = bending moment;
S = safe fiber stress, 18,000 lbs. per sq. in. for carbon steel;
Z = section modulus which for a circle is $\frac{\pi d^3}{32}$
d = diameter of the axle.

Then $M = S \times Z$ or $Z = \frac{M}{S}$ from which the section modulus necessary for any bending moment can be obtained. To find the diameter, since $Z = \frac{\pi d^3}{32}$, then $d = \sqrt[3]{\frac{32 Z}{\pi}}$

After a sufficient number of diameters have been obtained at different points, the theoretical shape of the axle can be dotted in. To allow for wear and for imperfections in the material, the diameter of the journals on heavy freight axles is usually made ½ in. larger than the theoretical diameter; the dust-guard seat is made ¼ in. larger; the wheel seat is made ¼ in. larger and the center of the axle ⅛ in. larger. Axles should never be allowed to wear below the theoretical sizes determined above. To compensate for lateral wear on the axles and brasses it is well to assume the loads $P_1$ and $P_2$ as being applied ½ in. outside the center of the journal. The center of gravity of the car and load combined should always be kept below 6 ft. from the top of the rail, but at whatever distance it may be below that point, the axle should be designed for the worst case, *i. e.*, 6 ft.

*The Journals.*—To avoid heating, the load per square inch of projected area on the journal should not exceed 350 lbs., cars being on a straight track. The proportions be-

tween the diameter D and the length L should be $\frac{L}{D} = 1.8$.

*Truck Arch-Bars.*—If the bottom tie-bars are reasonably well fitted, the bending strains may be disregarded and the tensile and compressive stresses due to the load can be determined as follows:

$$\text{Compressive force in top arch-bar} = \frac{Lm}{2a};$$

$$\text{Tensile force in bottom arch-bar} = \frac{Lb}{2a};$$

$$\text{Tensile force in column bolt} = \frac{Ld}{2a};$$

$$\text{Tensile force in tie-bar} = \frac{Lg}{2h};$$

$$\text{Shear in journal box bolt} = \frac{Ln}{2a}.$$

L is the maximum load coming on a set of arch-bars and the other symbols (Fig. 3) indicate the actual dimensions of the truck. The fiber stresses in the respective members of the side frame can be obtained by dividing the forces obtained as above by the effective cross-sectional area of the member. In the tension members the effective cross-sectional area is obtained by subtracting the area of the largest existing bolt or rivet hole from the total cross-sectional area. In the compression members only the maximum bolt hole area is subtracted since the rivets fill up the holes closely enough to be disregarded in compression.

The stresses in the arch-bars as found above should not exceed 6,500 lbs. compression, or 8,000 lbs. of tension per sq. in. for wrought iron or soft open-hearth steel so as to make the parts amply strong to resist other strains coming at times upon them. End shocks cause transverse strains, lateral swaying causes bending strains, uneven track causes torsional strains and unequal length of inner and outer rails on curves causes large bending strains. None of these can be accurately determined, so a large factor of safety is therefore used.

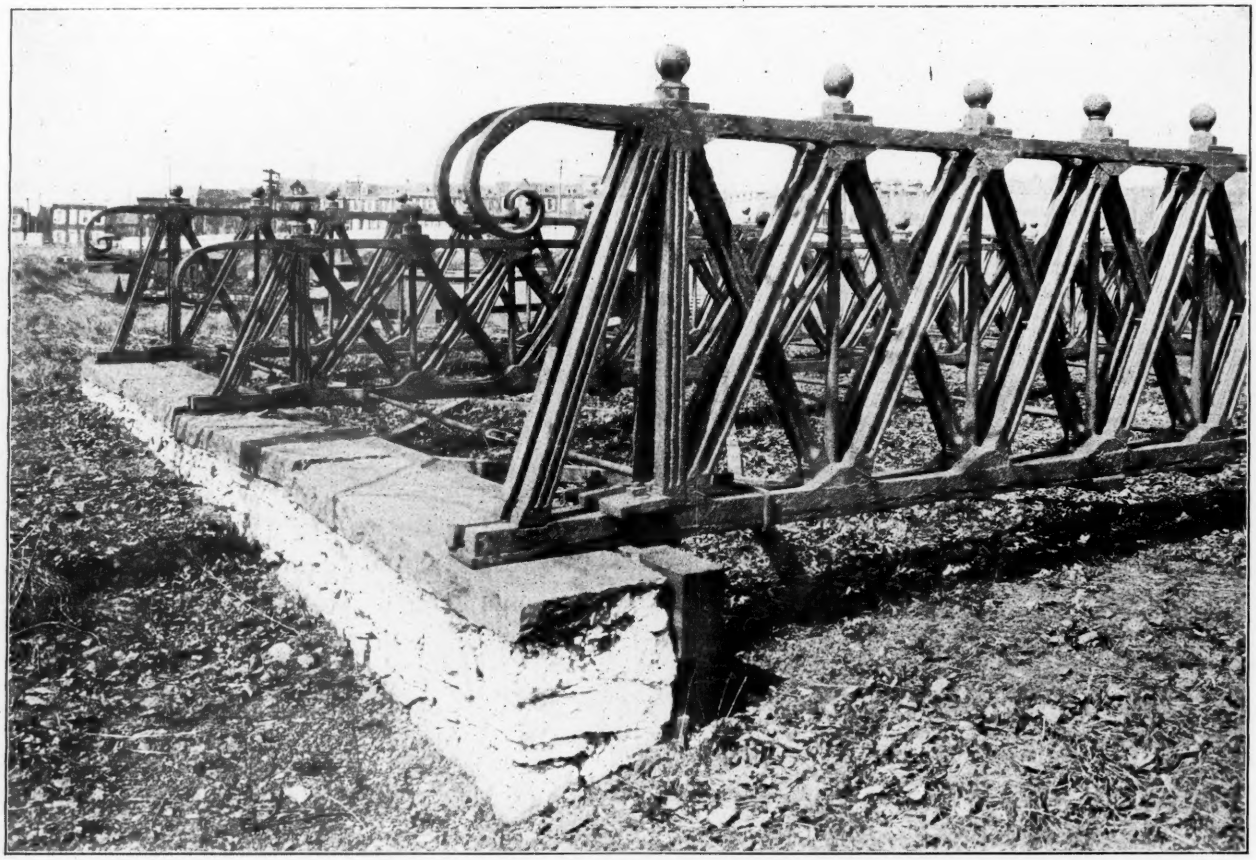
The maximum load L, coming on each set of arch-bars is derived from the load $Q^1$, which is half the load, half the weight of the car body and the weight of one truck bolster. For 60,000-lb. cars this new value of Q or $Q^1$ is 44,000 lbs. per truck; for 80,000-lb. cars is 56,500 lbs. per truck, and for 100,000-lb. cars is 69,000 lbs. per truck. Since the maximum horizontal force is $.4Q^1$ with the center of gravity 6 ft. above the rails, the maximum values of L are: 29,300 lbs. per set of arch-bars for 60,000-lb. cars; 37,000 lbs. per set of arch-bars for 80,000-lb. cars; 45,700 lbs. per set of arch-bars for 100,000-lb. cars.

*(To be continued.)*

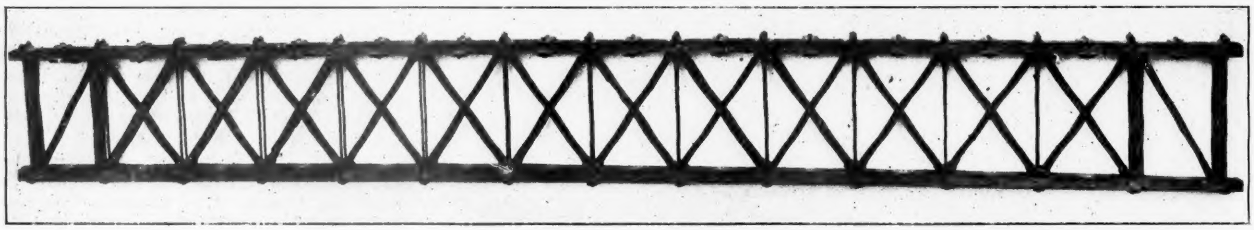
## The First Iron Railroad Bridge in the United States.*

BY EDWIN F. SMITH.

Nothing more clearly illustrates the need of technical education in early engineering than the comments which are found in a report, dated 1838, of the Little Schuylkill & Susquehanna Railroad, a line which had



**The Manayunk Bridge in Its Present Location.**



**Second Type of Iron Howe Truss Bridge, Philadelphia, Reading & Pottsville R. R., 1845.**

been admirably located by Edward Miller, an accomplished civil engineer and a citizen of Philadelphia.

The high bridges upon this line were a source of anxiety to the builders, there being no precedents for such structures for railroad traffic. They were, therefore, purely experimental, and in commenting upon the first one, 579 ft. long, the chief engineer,

*Supplemented with an extract from an address read by the author before the Engineers' Club of Philadelphia, and printed in the Proceedings of the club.

Solomon W. Roberts, says in his report: "The superstructure is of very strong lattice work, having three sets of lattice spans, well braced together. The length of the single span is 200 ft., which is that of the longest span upon the line." Then follows this remark: "This bridge was completed before the others in order to judge whether additional strength would be needed, and, if so, to learn the best mode of applying it." Also: "The lattice bridges are free from lateral thrust, and being continuous throughout, may be supported at any point indiscriminately. Such being the case, and the rivulets offering no obstruction, I propose that when the superstructure of each bridge is completed, the keys of the falseworks shall be loosened, and the falseworks allowed to remain standing within a few inches of the lower chords of the bridge, so as to obviate the possibility of accident, and, if found necessary, timber framed piers may be built half-way between the stone ones, so as to shorten the spans one-half, and to render the bridge more than strong enough to sustain any possible load. This will not be a very expensive expedient, and must be conclusive."

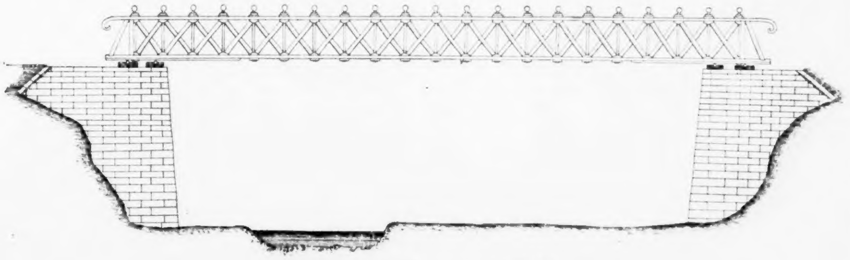
It was on this line of railroad, now the Catawissa Branch of the Philadelphia & Reading, and for the support of these same lattice truss bridges, that the first high trestles or timber framed piers in the country were built in the year 1840, work havin commenced on the Long Hollow Trestle in June of that year. They varied in height from 53 to 129 ft., and in length of superstructure supported, from 600 to 1,000 ft. They marked the beginning of high structural works in timber, and were essentially the same in principle as the constructions in steel now employed for the same purpose on railroads, as well as for the skeletons of the high buildings of the present day. They were designed by James F. Smith, Principal Assistant Engineer, who had obtained his early training on the Allegheny Portage Railroad, the woodwork of the working model being made by him, and the bolt-work by the late Ellerslie Wallace, M.D., Dean of Jefferson Medical College in this city, then an assistant engineer on the Catawissa Railroad. This model, which is now deposited with the Franklin Institute in this city, was placed upon a solid foundation and subjected to a weight of 6,460 lbs., without causing the least deflection in the posts, when the test was discontinued. In this practical way, without any calculations whatever, the sufficiency of the trestle piers for sustaining a railroad bridge was demonstrated. The same plan of trestle work shortly after adopted for the Portage Viaduct over the Genesee River, on the New York & Erie Railroad, by Silas Seymour, Civil Engineer. Thus, from what was designed to fulfil merely a temporary purpose, there was derived the principle embodied in the structural works of the present day.

Only five years after, there was built what we have reason to believe was the first iron railroad bridge in the United States. It was designed by Richard B. Osborne, Civil Engineer, then Chief Engineer of the Philadelphia & Reading, and erected in May, 1845, for a double-track crossing over a small stream south of Flat Rock Tunnel, near Manayunk. It was in service until the year 1901, but for many years had been carried on timber trestles, on account of the heavy traffic passing over it, for which it had not been designed.

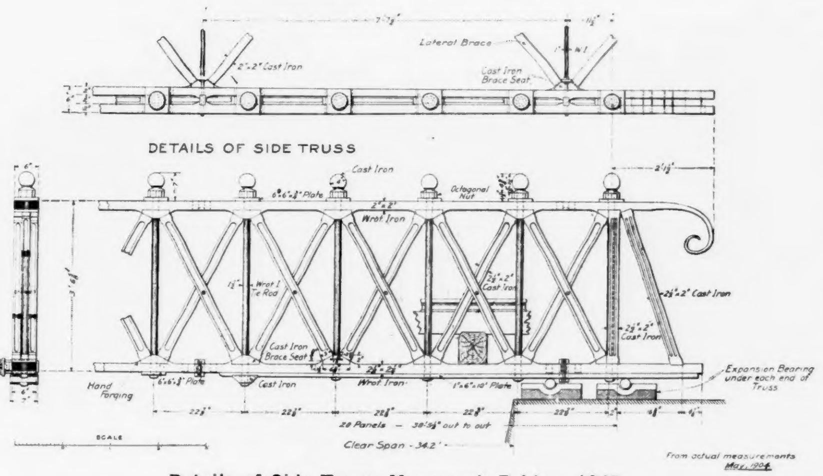
The following description is from Mr. Osborne's Journal: "During the winter of 1844, as a guide to us in arranging plans for the superstructure in iron to replace several old timber bridges, we got up plans for an iron Howe, which was the first ever constructed of that material, all others being of timber. The site we chose for this experiment was about half a mile east of the Flat Rock Tunnel—a small bridge of 34 2/10 ft. span. This was thought to afford a fair test, as the tracks were only 4 ft. apart and the ties were on the bottom chord. The center truss of this bridge would only be high enough to let the girders pass through the panels and rest on the bottom chord. This center truss was only 31½ in. high, so as to be below the platform steps of the passenger cars, while the outer trusses were 41¾ in. high. We made the bottom chords of 2¼ in. square rolled iron, which we afterward changed for other bridges into plates of 1 to 1¼ in. of greater depth, according to required area. The top chords were 2 in. square. Bottom chords were 2¼ in. square. The braces, of cast iron, 3¼ x 2½ in. hollowed and 3 ft. 4 in. long. Height of main truss, 41¾ in. Projections were welded on the chords, between which the skew back blocks rested on the chords. Height of center truss, 31½ in. It was erected in February, 1845, and cost $1,571.95 = 40.83 ft. length at $38.50. President Tucker came up to see the first trains cross it, and was pleased with it, but said it looked very light in comparison with the timber structures, and suggested that we leave the falseworks up within half an inch of the bottom chords to give it a longer test. This we did, and they remained until they fell down. This iron bridge carried many millions of tons before alterations became necessary for widening the space between the tracks from 4 to 6 ft."

There is a slight, though unimportant, discrepancy as to the date of erection. Mr. Osborne's Journal gives it as February, 1845. Later investigation has developed the fact that the work of building the trusses was begun in the shops of the company at Pottstown under Mr. Osborne's supervision in January, 1845, and finished in March. The work of erecting was commenced on Saturday night, May 3d, and the bridge was finished ready for the passage of trains on Sunday, May 4th, 1845. It was, as shown by the accompanying drawings, an iron Howe truss, with chords of solid bars of rolled iron, the upper being 2 in. x 2 in. and the lower 2¼ in. x 2¼ in. On these were hand forged lugs, for holding in place the cast iron angle blocks, on which rested the solid cast iron braces, which were fluted on the four sides and not hollow, as noted in the description. A noticeable peculiarity of the construction was the use of extra heavy canvas washers, of which a single thickness soaked in white lead was placed between the end of each brace and the lug as an abutting surface. A small portion of this, removed only lately, after having been in use for 59 years, was found to be as sound and apparently as good as when put in place.

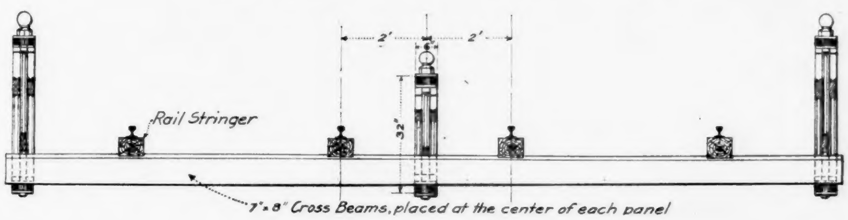
When we consider that all of the work on this bridge was done by hand, with only such meagre facilities as were afforded by a blacksmith forge and hand tools, we can



Elevation of Manayunk Bridge.




Details of Side Truss, Manayunk Bridge, 1845.




Cross Section of Bridge.

but admire the thoroughness and attention to detail of this early bridge work. It remained in place until the year 1901, although for many years before its removal it had been supported by heavy timber trestles. In its period of usefulness—56 years—it carried, without doubt, in the minds of those knowing the enormous tonnage of the Reading Railway, the greatest aggregation of tonnage that ever passed over any railroad bridge.

This first iron Howe truss, *with solid chords*, and the only one built of that pattern, was followed in the summer of 1845 by another, all the members of the trusses of which were the same, except the top and bottom chords, which were built up of flat iron, 5 in. wide x ¾ in. to 1¼ in. thickness. Three of these bridges were erected in the year 1845, the first over Stony Creek, near Port Clinton; the second over Irish Creek, near Leesport, and the third over Bingaman street, in the city of Reading. The model of this bridge was taken to England for exhibition by the late Richard Osborne, Chief Engineer, shortly after the erection of the bridges.

### Testing Plant of the Great Western, England.*

The Great Western has recently put in the erecting shop at Swindon a plant for testing locomotives. This machine consists of a bed made of cast-iron, bolted on a concrete foundation, with timber balks interposed to lessen vibration. On this bed five pairs of bearings are arranged to slide longitudinally so that they may be adjusted for any wheel arrangement. In these bearings, axles are carried having wheels fitted with steel tires, on which the locomotive runs. These axles are also fitted with drums on which band-brakes act for absorbing the power developed by the engine. Outside these band-brakes, pulleys having an 18-in. face are provided at each end of the axle for driving link-belts, so that most of the power developed by the engine drives air-compressors, so that it may not be wasted. The hydraulic brakes absorb just enough power to enable them to govern the speed of the engine. These brakes are actuated by a water-supply from an independent pump, the outlet of this water-supply being throttled either by a stop-valve or by a throttle actuated by a centrifugal governor.

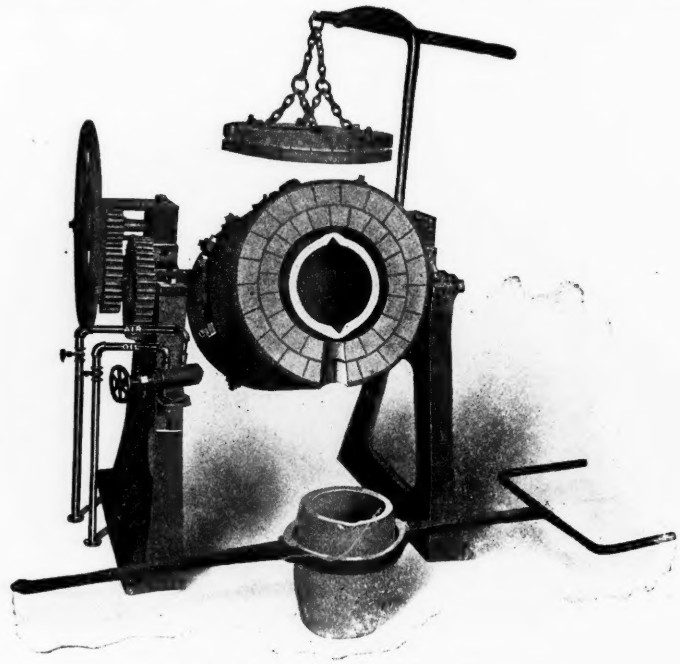
The carrying wheels are 4 ft. 1½ ins. in diameter. The main bearings are 9 in. x 14 in. This plant is intended not only for the purpose of scientific experiment, but also to do away with the trial trips of new and repaired engines on the main line. It has, therefore, been necessary to make it rapidly adjustable to take engines having wheels of different centers. The main bed is provided with a rack, and each pair of bearings is provided with a cross shaft having a pinion at each end. These cross shafts are driven from a longitudinal shaft through clutches. This longitudinal shaft is operated by an electric motor and is reversible. When running engines on trial trips it is essential that the truck and trailing wheels should be run in order that the axle-boxes take a good bearing. To accomplish this the carrying wheels are all coupled together by belts and jockey pulleys. It, therefore, follows that even when a locomotive having a single pair of driving wheels is run on the plant, all the carrying wheels are rotating and in turn run the bogie and trailing wheels of the locomotive. The jockey pulleys are necessary to retain the proper tension on the belts when the bearings are moved longitudinally.

Owing to the varying height of the footplates of different classes of engine, it has been found necessary to provide a firing stage which can be rapidly adjusted vertically. A large coal bunk is provided in connection with this stage and also weighing machines. Two water tanks are mounted on the same platform, for measuring the water used when running. These tanks are emptied alternately when a test is being made. Under the platform a dynamometer gives the drawbar pull of the engine, and this, together with counters on the wheels, enables the actual drawbar horse-power to be measured, and so compared with coal and water consumption for different classes of engines. As engines of different lengths are to be tested, and of necessity have to be fixed at the trailing end to the dynamometer, it is necessary to have a sliding chimney for carrying off the steam and smoke. This consists of a long box, having a steel plate running on rollers forming its lower surface, which plate carries a large bell-mouthed chimney. This box not only enables the chimney to slide longitudinally, but will also form a receptacle for ashes and any other matter ejected by the engine.

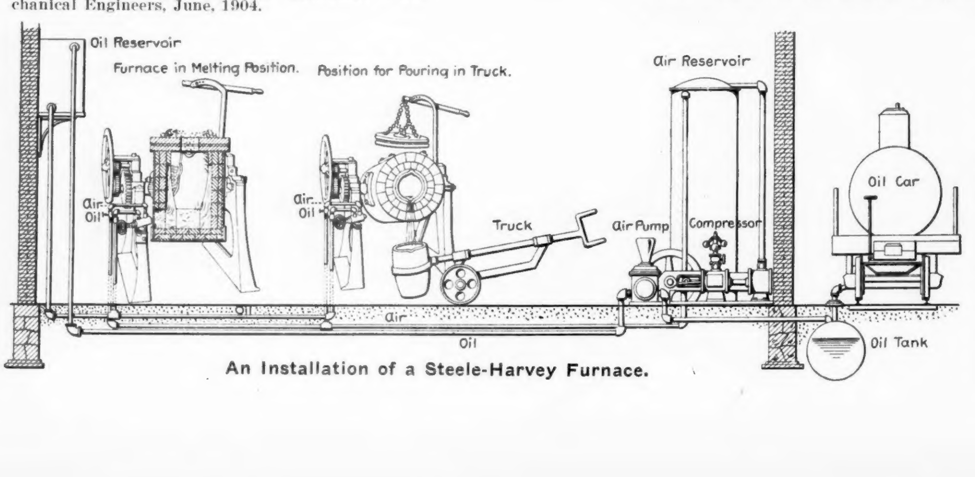
*Abstract of a paper by Mr. G. J. Churchward, read at the joint meeting of the American Society of Mechanical Engineers and the Institution of Mechanical Engineers, June, 1904.

### The Steele-Harvey Metal Melting Furnace.

The accompanying illustrations show a self-contained crucible oil furnace for melting copper, brass, tin, or steel. It consists of a shell lined with a double row of fire brick, and a crucible resting on a graphite block. The crucible is held in the center of the shell by means of fire brick wedges. A flame from a vaporizing oil burner is directed against the graphite block and in turn circulates entirely around the outside of the crucible. The flame not coming in direct contact with the crucible prolongs the life of the crucible from 20 to 50 heats. A lid placed over the crucible prevents the escape of gases and also prevents the mixture in the crucible from oxidizing. It is not necessary to remove the crucible from within the furnace when pouring, and thus cool it off, as the furnace is swung on trunnions and is easily tilted to any angle by means of the gear wheels and worm connections. This furnace is especially adapted for melting brass borings and turnings. It is claimed that 100 lbs. of metal can be melted with 1½ gal. of crude oil. The Monarch Engineering & Manufacturing Company, Baltimore, Md., make these furnaces in four different sizes with capacities of 2,400 to 4,000 lbs. of metal per day.

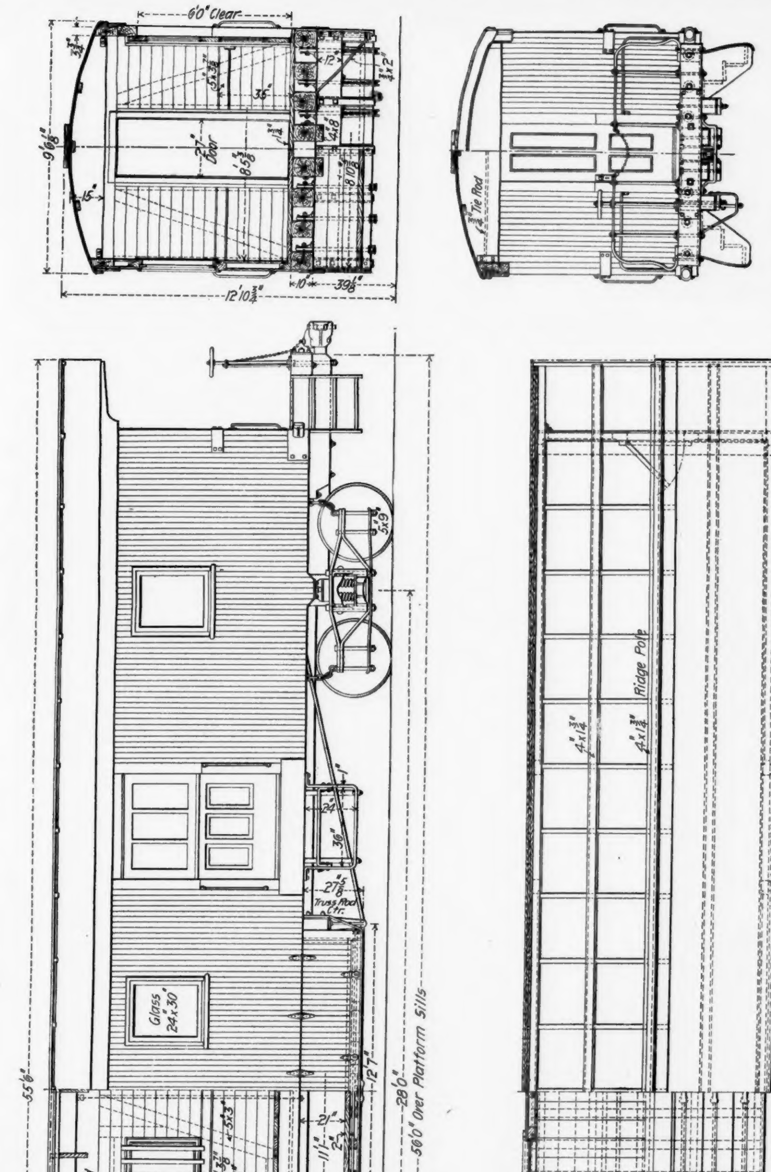


The Steele-Harvey Metal Melting Furnace.




An Installation of a Steele-Harvey Furnace.

Certain Russian cities are allowed a tax of about 5½ cents per ton on all freight shipped or received at railroad stations.




Plan, Elevations and Sections of 50-ft. Tool Car, Central Railroad of New Jersey.

## Jersey Central Tool Car.

The Central Railroad of New Jersey has built an exceptionally long and heavy tool car for the wreck train, which is shown in the accompanying drawings. It is 50 ft. long over end sills, 8 ft. 5⅜ in. wide inside and 7 ft. 2 in. high from floor to carlines. A tool car must carry a heavy load in the aggregate and for this reason and because of its extreme length the underframe for this car has been made very strong. It consists of eight sills, 8 in. x 10 in., with two 4-in. x 8-in. sub-sills under the center sills. Six 1¼-in. truss rods are hung underneath and carried over the bolster through the end sills which are 10-in. x 10-in. timbers. The body framing of the car is similar to freight car construction, except that suitable openings have been provided for the 4-ft. door openings on each side. The roof is curved on an 11 ft. 9-in. radius and all of the carlines are cut to that shape on the top edge. The outside covering is tin laid on 13/16-in. boards; no sheathing is put on under the carlines. The sides of the car are sheathed on the inside all the way up and the window openings are protected with slats.

At each end of the car is an open platform, 26 in. wide, which is carried on 8-in. x 10-in. platform sills bolted under the four middle sills of the body framing. The platform end sill is a straight timber, 10 in. x 10 in., sheathed on the outside face with a 10-in. channel. Williamson and Pries tandem spring draft gear and freight couplers are applied in the usual manner between the two middle platform sills, which are carried back to the body bolster.

Under the middle of the car, in the rectangular space formed by the truss rods and the king posts, is built a tool box 11 ft. 1 in. long, 21 in. high, and the full width of the car with hinged doors on each side. It is carried in a cradle formed of five pieces of ¾-in. x 3-in. bar iron bolted to the needle-beams. The car is mounted on arch-bar trucks with 5-in. x 9-in. journals.

We are indebted to Mr. William McIntosh, Superintendent of Motive Power, for the drawings.

## The American Railway Association.

This organization has voted to admit as associate, roads less than 50 miles long, the qualifications for admission to be passed upon, as in the case of full membership, by the executive committee. Associates may not vote. They will be assessed $20 yearly, but will not be subject to mileage assessment. The association has also formally indorsed the Master Car Builders' Association report on tank cars, which was published a year ago, and recommends that the requirements of the report be made effective, so far as new construction is concerned, from May 1 of this year. The requirement as regards safety valves in tanks is recommended to be put in force September 1 next, and that concerning the strengthening of underframes on January 1, 1905. The foregoing are the principal items of news to be found in the *Proceedings* of the April meeting, just issued, which were not given in our report of the meeting, published May 6. The report on tank cars, with the drawings, is reprinted in full in the present number of the *Proceedings*. This number also contains the report of the committee on car service, accompanied by samples of the blanks to be used in reporting the per diem earnings on interchanged cars, as approved by the association. The principal change in the rules (3 and 10) in regard to penalty

per diem notices is one making it compulsory to send the notice on the prescribed form.

The cipher code which the committee on that subject proposes to issue is to be a very complete work. The committee has considered 95,000 phrases and has conditionally approved 53,000. The book will be one of 600 pages, and the committee expects to have an edition of 1,000 copies made, so as to furnish a sample to each road. For this purpose an expenditure of $6,500 was authorized—half for editorial work and half for making the plates and books.

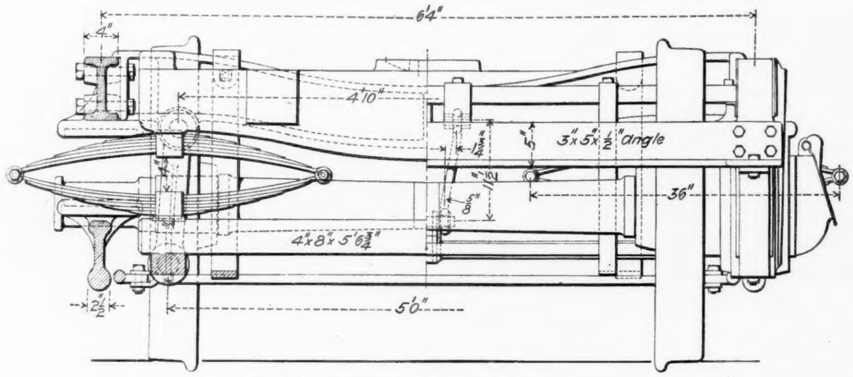
The discussion on the report of the car service committee brought out from Mr. Kouns, of the Atchison, a demand for the increase of the regular per diem rate to 30 cents a day and the repeal of the penalty rate. Mr. Kouns voiced the views of many roads working long lines, but the majority agreed with the committee that no change had better be made at present. Mr. Hale, Chairman of the committee, made a forcible argument. The statistics which he presented showed that on 42 roads, owning 1,236,000 cars, the average amount paid for borrowed freight cars, including penalty, was, for the first year, 21 cents 9 mills a day, from which he argued that the penalty had not yet imposed a severe burden on any one. One road reported its average payments at 27.3 cents, but the great majority were around 22 cents, and two reported 20 cents, showing no penalty payments whatever. Although 22 cents is an inadequate sum, still, said Mr. Hale, it is 10 cents better than owners were getting two years ago. It is only the long roads that want a higher rate. While it is true that they ought to have more, it is not fair just yet to raise the price on the little fellows; that is, the shorter terminal lines. With all the criticisms concerning the working of the penalty rule, it remains true that the penalty does move the cars quicker than the 20-cent rate. A penalty for diversion is desirable, as it always has been, and the committee has considered the question long and earnestly, but no one has yet found any acceptable way of enforcing such a rule.

In the per diem statistics reported by the committee the average value of all freight cars owned by each company reporting is given. This average fluctuates from $250 to $692. The average value of box cars carrying 30 tons or over fluctuates from $345 to $957. The names of the roads reporting are not given.

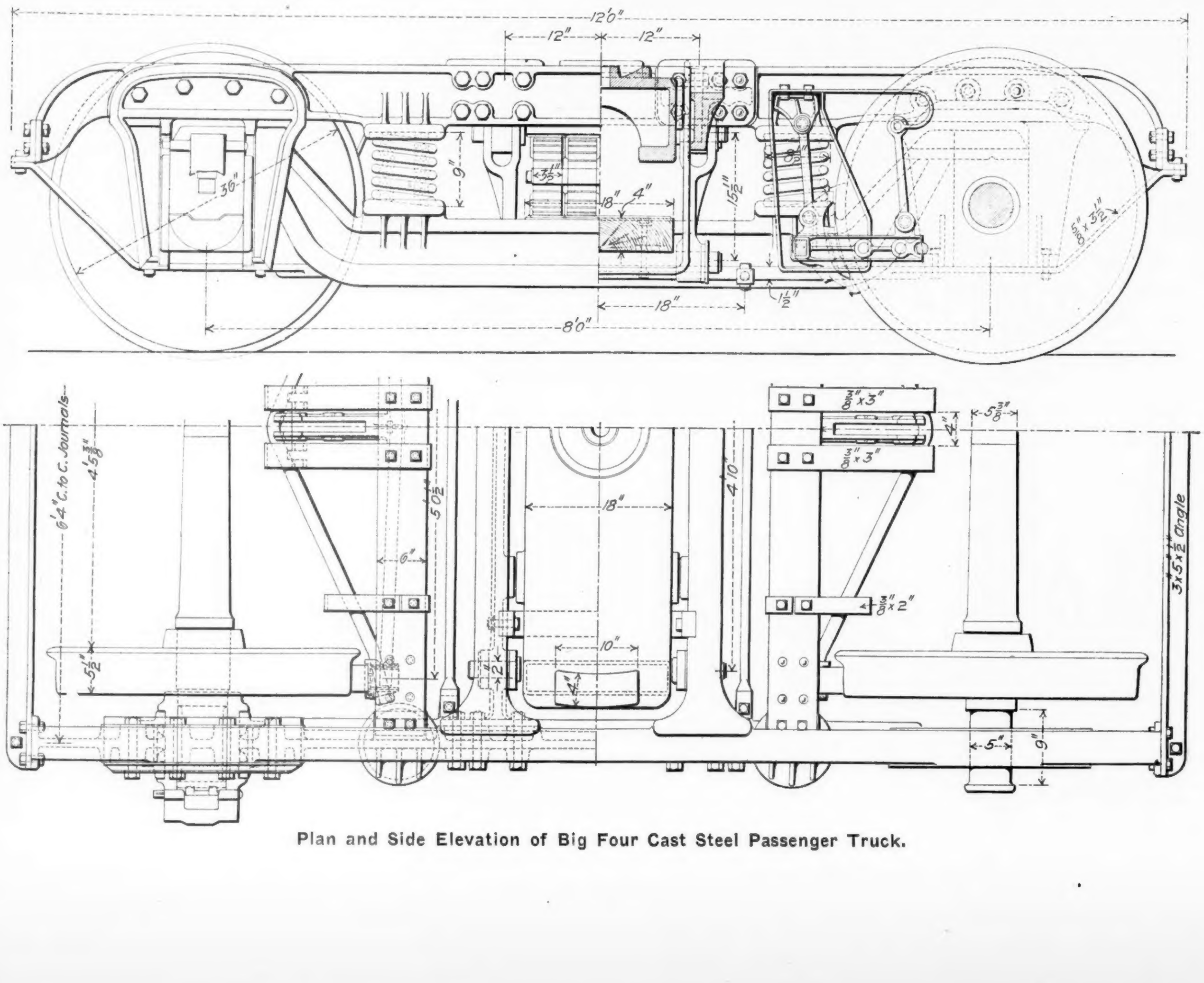
## Cast-Steel Passenger Truck for the Big Four.

The accompanying illustrations show an interesting design of cast-steel four-wheel passenger truck, a number of which have recently been built by the Big Four to be placed under some new baggage cars building at its Brightwood shops. The all metal passenger truck is not altogether a new idea for steam roads as the Lake Shore has a large number in service but the use of cast-steel is a decided innovation. The Lake Shore truck has I-beam side and end frames and transoms with a double I-beam bolster and wooden spring plank. All of the other details are similar to those used on wooden frame trucks.

The Big Four truck is all-metal with the exception of the spring plank, and all of the important members are cast-steel. It differs but little in its general appearance from a wood frame truck. It is rated at 80,000 lbs. capacity and weighs 13,000 lbs. complete. The bolster is cast in one piece with the side bearings and center plate formed on the top surface. It is a channel trough section open at the bottom and is 18 in. wide. At the ends it is 7 in. deep and at the center is 10 in. deep. The rib along the bottom of the sides is increased in thickness from ¾ in. at the ends to 1½ in. at the center to add to the vertical stiffness. The wheel piece is




End Elevation of Big Four Truck.




Plan and Side Elevation of Big Four Cast Steel Passenger Truck.

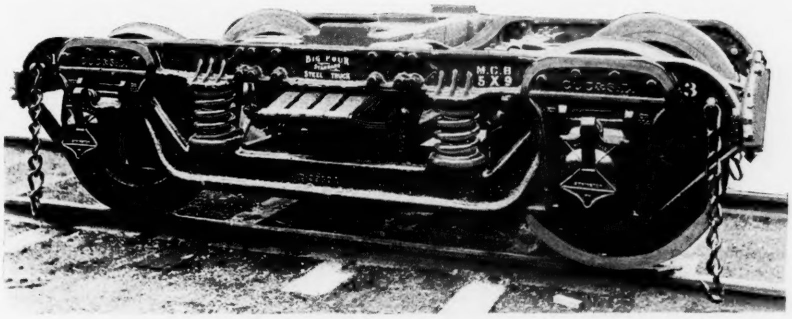
made in one casting 11 ft. 6 in. long. It has an I-section of uniform dimensions between the pedestals. The depth is 7 in. and the web is 1 in. thick. The equalizer spring caps are cast on the under side and are ribbed with three ½-in. ribs on the outside and two on the inside. Where the other parts of the truck frame are fastened on, the bearing faces are all machined and all of the bolt holes are drilled.

The transoms which are an inverted L-shape are 7 in. deep and are bent down 3¾ in. in the center to clear the body of the car. A boss, 5 in. x 6 in., cast on the inside face, acts as a bolster chafing plate, and on the ends a flange is formed 7 in. deep and 12 in. wide with a projecting lip along its top edge. This gives an ample bearing for the joint between the transom and the wheel piece and the lip which fits over the top of the wheel pieces relieves the bolts of the downward shear. The equalizer bars are an approximate I-section and have the equalizer spring seats cast on them in the same way that the spring caps are cast on the wheel pieces. They are 8 in. deep with a drop of 7½ in.

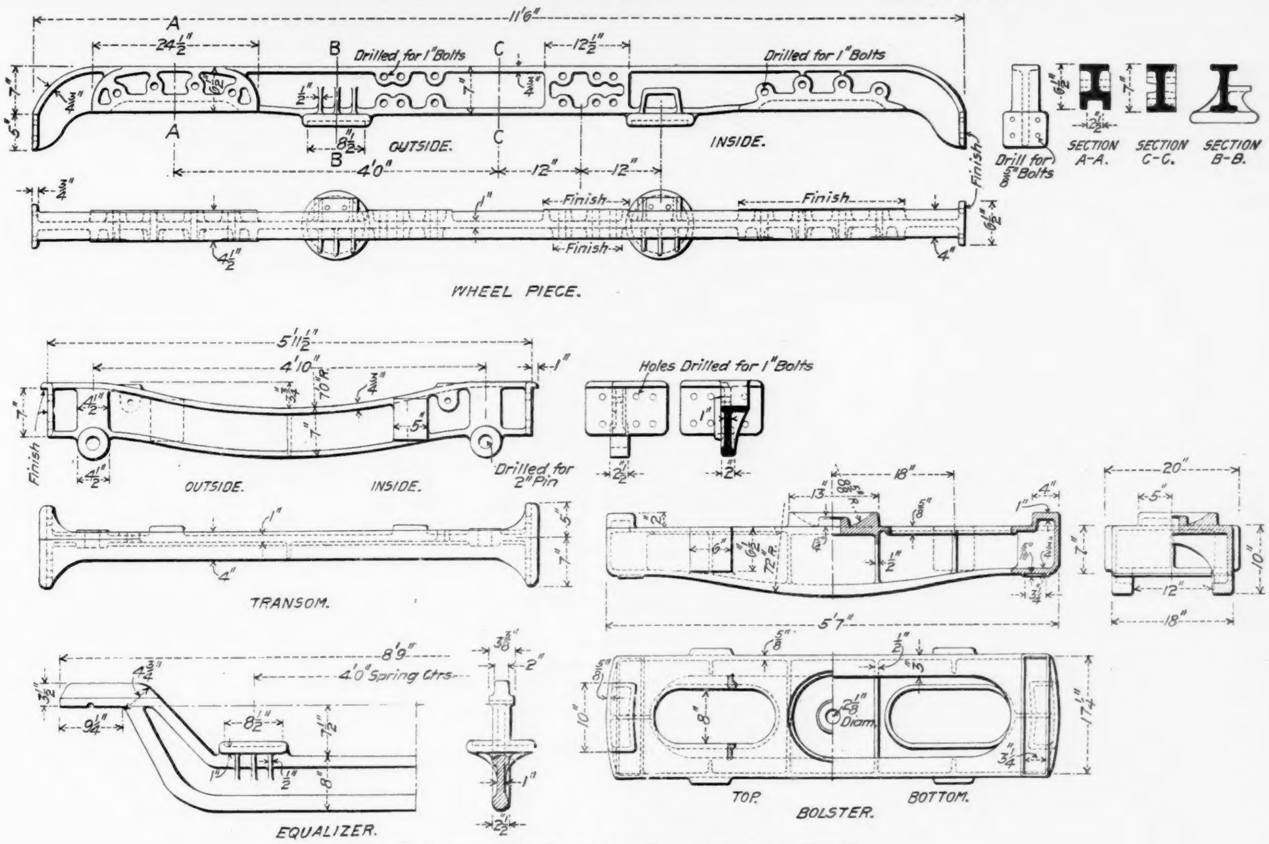
The end pieces of the frame are 3 in. x 5 in. angles bolted across the ends of the wheel pieces. The brakes are inside hung and as there are no safety beams the end pieces serve merely to tie the wheel pieces together, nothing being suspended from them. All of the brake rigging is hung from two 6-in. channels, placed flanges down just outside the transoms and bolted to lugs cast on the inside of the wheel pieces. The brake-beams are hung from two hangers suspended from carriers bolted on the under side of the channels over the brake-shoe heads, and the ⅜-in. x 3-in. release springs from which the beam is supported in the center are bolted on top of the channel.

A wooden spring plank has been used to somewhat deaden the metallic sound of the whole truck and to absorb the small vibrations set up in such a rigid construction. Two 1-in. bottom cross ties, connecting the bottom tie rods on each side, are put in to further stiffen the truck in a transverse direction. No rivets are used at any point, all the connections being machined and bolted. This construction gives the greatest possible rigidity and at the same time permits the truck to be easily and quickly dismantled for repairs. The experience of the railroads with cast-steel bolsters and other parts has been almost uniformly satisfactory, and with well designed sections such as have been used in this truck there should be little trouble from failures due to defective castings or breakages under shock.

We are indebted to Mr. William Garstang, Superintendent of Motive Power of the Big Four, for the illustrations.




Cast Steel Passenger Truck for the Big Four.




Cast Steel Details of Big Four Passenger Truck.

## The Telegraph Operator in the Railroad Service.*

BY JOHN B. TALTAVALL.

The lack of a trained understanding in the more important details of his profession on the part of the average telegraph operator is too often a serious drawback to his true usefulness. A student life is requisite for the full intellectual development of the telegrapher. But to this comparatively few aspire, and we are compelled to accept the operator as we find him. Only a very small percentage of telegraph operators possess either the inclination or the necessary perseverance to acquire telegraph and other electrical knowledge from books. Yet the careful and systematic study of books is a most influential help to the individual whose ambition is to win success in life, and operators should make the best possible use of this means of self help, reading and rereading their technical volumes, so that the matter therein treated may become familiar and firmly established in their minds. But if a railroad company desires to increase the efficiency of its telegraph staff it should detail a competent person to enlighten those operators needing information. All railroads have in their employ many persons abundantly able to fill the position of such an instructor.

A common deficiency among operators is failure to understand the management of the switchboard and adjustment of relays.

*Abstract of paper read before the Association of Railway Telegraph Superintendents at Indianapolis, June 15.

Comparatively few employes of the telegraph department of any railroad are able to make a patch or to test the wires for ordinary faults, or to manage repeaters, and to balance duplex and quadruplex apparatus, now used on many railroads. Four operators in as many different offices on a well known Eastern trunk line were obliged recently to confess their ignorance of how to make a patch. In another instance a day operator in a certain office understood how to patch, while the night man at the same point was unable to do so. The unequal conditions in the same office were the cause of much anoyance, necessitating the occasional calling of the day man to the office during the night.

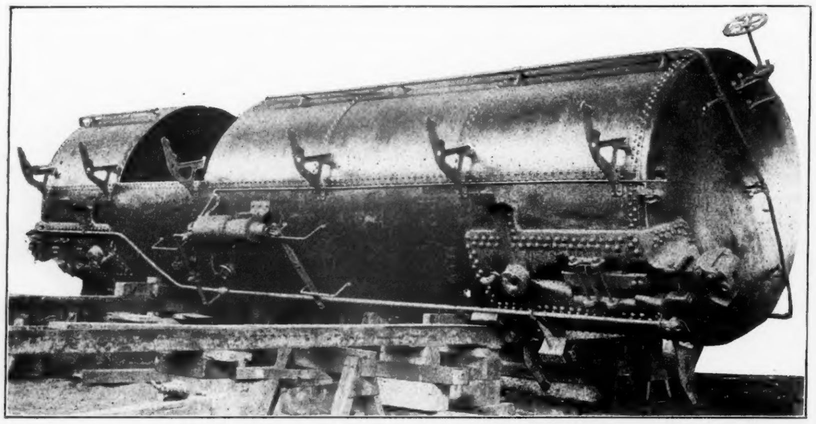
Printed instructions covering switchboard practice, even when accompanied with blue prints, frequently are not understood, especially when the information is so voluminous that it confuses and mystifies the operator. Text books are all right, and their study should be encouraged; but a qualified person should call upon the operator and, by means of a specially drawn diagram, carefully explain the particular board which he is expected to handle. An explanation of a twenty-strap springjack switchboard is of little use to an operator wishing to learn how to handle an eight-strap peg switchboard.

One superintendent of telegraph informed the writer that on his road few of the operators knew how to adjust the relays properly. It never occurred to many of them, he said, that the magnets could be withdrawn from the armature or placed nearer to it, and in wet weather offices far apart could not break each other. A few minutes' personal explanation on adjusting relays would do more to lessen the burdens of many train despatchers and others than a month of reading could accomplish.

A man stationed at a busy junction not long since informed the writer that he felt impelled to resign his place because he had been given a set of repeaters to handle, the manipulation of which he did not understand. He was, in consequence, in a constant state of worry, and the daily receipt of complaints from his superintendent, from train despatchers and others, reflecting upon the inferior repeated service, made life to him a burden. All this might have been obviated if the person who installed the repeaters had been capable of instructing the unfortunate operator on their adjustment and management. This operator was a fairly bright man, and a brief explanation at the outset would have removed all embarrassment. In every office, however small, there should be diagrams showing every piece of telegraph apparatus in the station, to be kept permanently for reference. Then, in addition, if each operator had the construction of each instrument and the switchboard thoroughly taught to him the efficiency of the entire line would be distinctly improved.

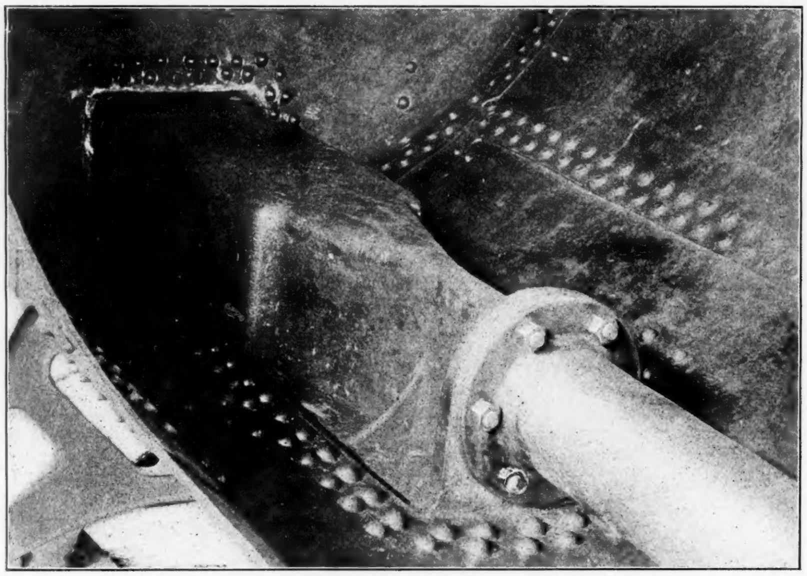
### The Bettendorf Tank Car.

The Van Dyke tank car described in the *Railroad Gazette*, March 6, 1903, was a radical departure from previous practice in a number of respects. The most noteworthy feature of this design was the absence of underframing, the car consisting essentially of a tank and trucks. The Union Tank Line has over 600 of these cars in service, and they have given entire satisfaction.



Bottom View of Tank Showing Draft Gear.

Most tank cars have a high center of gravity, because the tank is raised well above the standard height of drawbar in order to get the draft gear in place. Mr. W. P. Bettendorf has designed the car shown in the accompanying engravings, which has a low center of gravity and which still meets all operating conditions. In general appearance the car is quite similar to the Van Dyke design, there being no underframing. The bottom of the tank is 12 in. lower than the Van Dyke car, and it is the manner of doing this that makes the design one of peculiar interest. This is done by putting the draft gear above the bottom of the tank, its center line being 5 in. above the bottom sheet. This required a special form of casting for housing the draft gear, made of thoroughly annealed steel, and which is a combined draft member and body bolster. It is let in through the bottom and end sheets, to which it is securely riveted. To relieve the tank sheets of buffing stresses and the rivets of shearing stresses, a hollow cast-steel column is interposed between the draft castings at opposite ends of the tank. This column is made in three sections with flanges and is bolted together and to the draft castings. The middle section has two supports cast on either side midway of its length, which are riveted to the bottom of the tank. The ladder is riveted to bosses cast on the top of the column. This section also has a passage cored through it vertically for the valve rod to pass through. As shown in the side elevation of the car, provision is made at each end of the column for a steam connection, enabling it to be used as a heating pipe for the oil, if desired.

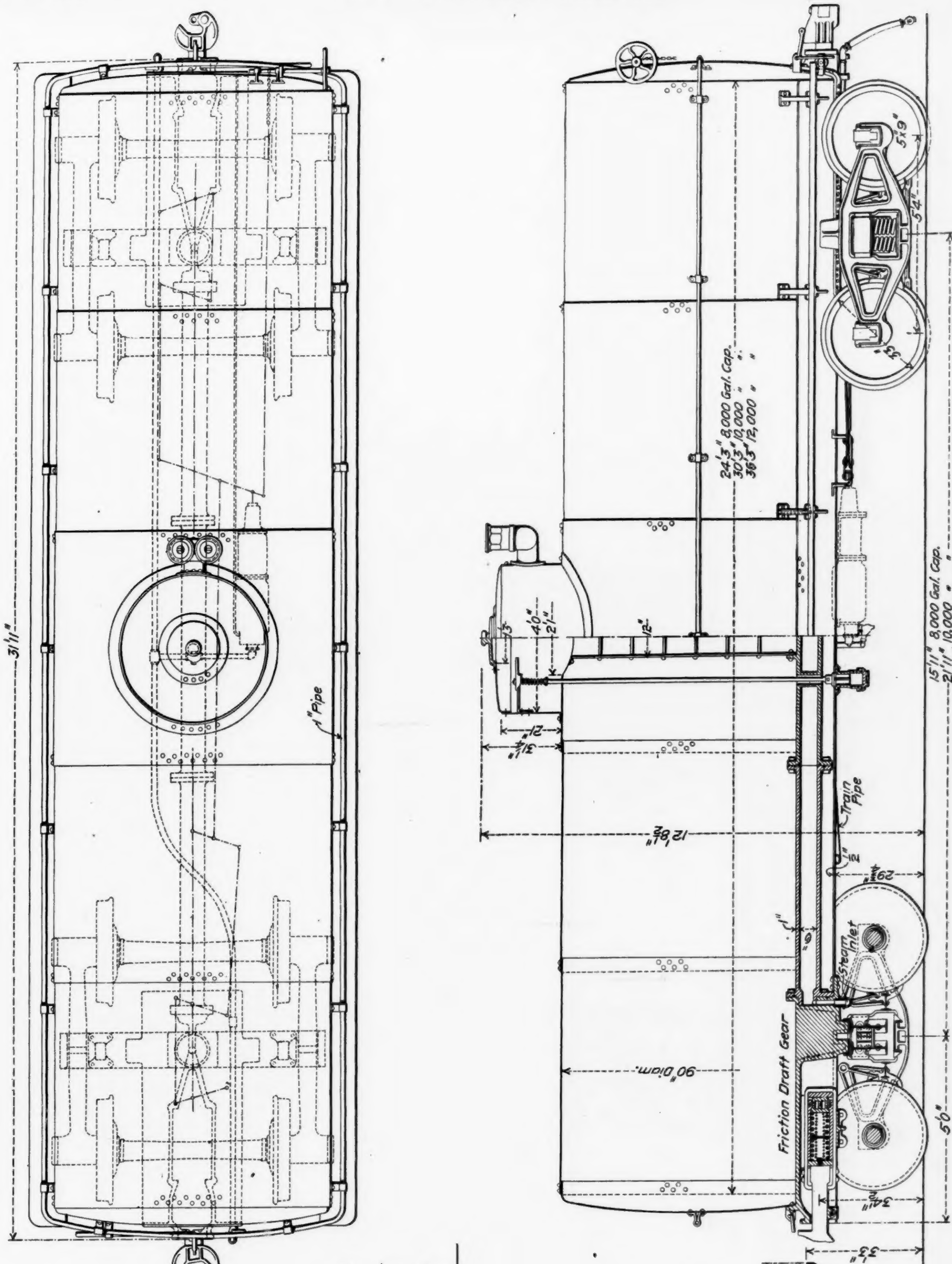


Inside of Tank Showing Draft Casting and Buffing Column.

Although the hollow cylinder is considered to be the best section to use for a buffing column, two I-beams or channels can be substituted if desired. The column was designed as follows: Using 10,000 lbs. per sq. in. as a safe compressive strength and assuming that out of 35 sq. in. in the bottom sheet, 20 sq. in. is available for buffing strength, this with the 22 sq. in. in the column will permit a safe buffing load of 420,000 lbs., which is ample for service requirements. The pulling load is borne by the bottom sheet, which at 10,000 lbs. per sq. in. is capable of sustaining a stress of 200,000 lbs.

The running board is supported by six malleable-iron brackets riveted to the tank at a convenient height. The hand rail is placed at such a height that it can be reached from the ground. At each end of the truck bolster there is a step as a safeguard and convenience. The car is mounted on the Bettendorf truck described in last week's issue. In special cases, such as for volatile oils, a cover plate is riveted to the bottom of the tank over the draft casting to cover the rivets. The tank is equipped with improved duplex safety valves.

The distance of these tanks above the rails is the minimum that will permit the trucks to swivel enough to allow the car to pass




Plan, Elevation and Sections of Bettendorf Tank Car.

around a 65-deg. curve. They are made in 8,000, 10,000 and 12,000 gal. sizes, the only difference being in the length. The weights of these three sizes are 31,000, 35,100 and 40,-000 lbs. respectively. The cars are built by the Bettendorf Axle Company, Davenport, Iowa.

## The Storehouse System at Altoona.

BY GEORGE L. FOWLER.

Since Altoona is the headquarters of the mechanical department of the Pennsylvania Railroad for its lines east of Pittsburg, the storehouse at that point serves as the main distributing center. The method of receiving, storing, distributing and transferring material on so large a scale must necessarily possess the two prime requisites of simplicity and accuracy. It must be simple in order that the working cost may not be excessive, and it must be accurate, for the primary reason that inextricable confusion would result if it were not. There must necessarily be more or less of elaborateness in any system that can be adopted and worked in such a place, but a careful consideration of that in use at Altoona will show that it meets the two requirements laid down with remarkable efficiency.

The one thing that must be guarded against in the work is an exhaustion of the stock, and in order to meet any emergency that may arise, supplies for two months are kept on hand, that is to say, there is, upon the first of any month, a stock on hand sufficient for two months' consumption, while requisitions have been placed with the purchasing agent for the following month. Thus on the first of May, the inventory will show that the stock on hand is sufficient to last until July first. It is, of course, difficult, if not quite impossible, in many instances, to know exactly what the demand will be three months in advance, and, for that reason a system of averaging is used. The average consumption for the three months just past is used as a basis for the requisitions of the third month to come. If the shops are working and have been working a full time of ten hours per day, and it is expected that this will be the case on the third month to come, the full amount of the average is taken. If, however, there is to be a change, the requisition is modified accordingly. For example, if the working of the shops during February, March and April has been ten hours per day, and it is known that it will be but eight hours in July, the average is likewise cut 20 per cent. and a corresponding requisition issued. An increase in the hours of work is cared for by a corresponding increase in the requisition.

The quantities to be ordered on these requisitions are determined in this way, partly by the departments where they will be used, and partly by the storekeeper. The department attends to all matters pertaining strictly to its own work, such as the parts of locomotives and cars, which are ordered by the respective department heads, while small and manufactured articles, especially those of a miscellaneous character, such as bolts, screws, nails, tin plates, etc., are cared for by the storekeeper.

It is well known that a large portion of the supplies of the Pennsylvania Railroad are purchased on carefully prepared specifications, but these have no influence whatever upon the routine of the work of the storekeeper now under consideration. The piecework method of paying for work done in the shop, does, however, have a great influence, and that will be considered later. To give an idea of the magnitude of the work, it may be stated that there are at present upwards of twenty-five thousand items in the Altoona stock list. In discussion of the methods of handling and accounting for this material, we first come to its delivery at the storehouse, in response to the requisition. As soon as the material is received it is stored in bins if it is small, and in the yard if large, and a record of the same is placed upon a bin card, M. P. 48 of the form shown in Fig. 1.

This card is attached to the storage bin and tells, at a glance, the amount of material on hand, with reference to the inventory account that is kept in a book of the form shown in M. P. 50 (Fig. 5). It also refers to the stock book number, so that the whole history of the quantities of any one item is immediately available. It will be seen that the material on hand at the first of the month, that received during the month, and that consumed and transferred, are noted. These three items are written in whenever any change is made. As goods are received the number is recorded, and whenever an item is taken out, though it may occur twenty times a day, the fact is noted, so that the card indicates the condition of stock at all times. This card remains for the month for which it is made out and at the end of the same, the receipts and issues are totalled, from which is determined the quantity remaining, and this is entered in the column "On Hand at First of Month," for the next card.

A similar card, M. P. 49, shown in Fig. 2, carries the record in the office of what is on hand and what is still expected on requisitions. A comparison of these two cards at the end of the month, therefore, enables the storekeeper to determine at a glance what might be called the credit of any article. Form M. P. 48 gives him what is on hand; and form M. P. 49, what is expected, to which must be added enough to make up three months' supply, which is to be the requisition for the third month to come. It will be seen, then, that the requisition sent to the purchasing agent may not check exactly with that sent in by a department head. It depends upon the stock on hand and expected, whose total, in turn, depends upon the rate of consumption during the past 30 days. This requisition is also made out on a special blank. This, when filled as the result of the operations of the stock book and cards, is forwarded to the master mechanic for approval, and thence through the proper chamber to the purchasing agent.

In addition to these cards two books of permanent record are kept by the storekeeper. These are printed to the form of M. P. 226 and M. P. 182. (Figs. 3 and 4.)

M. P. 226 is a register of requisitions, and the various items are filled in after the requisition number as indicated. All but the last three columns, of the date when filled, the car number in which the goods were shipped and remarks, are filled when the requisition is received, and these later when the last of the goods have been shipped. M. P. 182 is a record of material ordered and received and occupies the two opposite pages of the book, giving full information as to the condition of an order or requisition for the renewal of supplies in the department. This is filled in from the bills as rendered with the receipt of the goods whether the shipment is in full or in part. The headings at the top of the several columns indicate very clearly the information that they are to contain and need no comment except to note that it is quite possible that some items may not need an entry under each and every column.

When this information has been taken from the bills, the latter are checked as correct by the storekeeper and sent to the master mechanic for official approval, and thence to the shop clerk who is essentially the auditor of the department: the storekeeper reporting to the master mechanic.

In order to avoid the bulky accumulation of the M. P. 48 and M. P. 49 cards and the difficulty of referring to them for past records of consumption to ascertain the needed amount to be placed upon requisition, the stock book shown in M. P. 50 is used. It will be seen by a reference to this that the stock book number must correspond with that on the card, as must also the inventory account number, the location of section and bin number, to which is added the unit for the price quotation, whether number, weight or length. The amount on hand can be taken from either of the two cards, the price from bills or from the receipt book, M. P. 182; while the monthly record of received, consumed and transferred are the totals of the corresponding columns of card M. P. 48.

This completes the record of all material received and distributed as far as the amounts in inventory are concerned. The work of the storehouse does not end here, however. Altoona, as already stated, is a general distributing center, and shipments are of daily and hourly occurrence to all of the smaller shops, roundhouses, stations and offices. In the distribution of material to outside points a number of forms are used, such as Form M. P. 201, which is merely a notice to the Altoona agent to make out way bills and forward the articles named to destination, and is not shown. Form M. P. 291 is a form of requisition used by the division of the motive power department beyond the jurisdiction of the master mechanic, and, after the approval of the superintendent of motive power, is registered in the storekeeper's office, as shown on M. P. 226. It also enables the shop clerk to enter the proper charges and credits. This form would be used, for example, were material to be ordered to the machine shop from the car shop. Form M. P. 87 (not shown) is used as a shipping notice where material is ordered irregularly, as by a memorandum, or telephone order, or by parties who do not use the regular forms of the motive power department as the transportation or permanent way departments. This form is sent to the office of the shop clerk by whom the charges are made, while the usual shipping notices are sent on the forms M. P. 87 and M. P. 7.

Form M. P. 7 is the storekeeper's notice to the consignee of the shipment of material. It is checked off by the consignee and returned to the storekeeper, to whom it is only useful as a receipt for material delivered and a means of proving such delivery or shipment. It serves its purpose just as a returned bank check may serve as a receipt for money paid. It has no bearing whatever on the inventory which is cared for entirely by the two cards M. P. 48 and 49. In this way material is received, checked and distributed to points outside the Altoona machine shops, everything being regarded as foreign. It remains now to see how the same method is followed in a distribution among the shops themselves. Here there are a series of requisitions and orders passing between the shops and the storehouse, labor charges being added to original costs in the shops.

The piecework system that pervades all departments of the shops contributes very materially to the ease with which these accounts are kept. To further facilitate the clerical work, each department such as the paint shop, spring shop, tin shop, etc., is known by a number rather than a name, and all work is done on an order number. Where there is no interchange, that is to say,

PENNSYLVANIA RAILROAD COMPANY.
PHILADELPHIA, BALTIMORE & WASHINGTON RAILROAD COMPANY.
NORTHERN CENTRAL RAILWAY COMPANY.
WEST JERSEY & SEASHORE RAILROAD COMPANY.

Article ______________________

Section ________ Inventory Acct. No. ________

Bin No. ________ Stock Book No. ________

Price ______________________

| Month | On Hand at First of Month | RECEIVED | CONSUMED | TRANSFERRED |
|---|---|---|---|---|
| | | | | |

Fig. 1 —M. P. 48: Bin Card.

Deliver to Stock Room Dep't No. ________

PENNSYLVANIA RAILROAD COMPANY.
PHILADELPHIA, WILMINGTON & BALTIMORE RAILROAD COMPANY.
NORTHERN CENTRAL RAILWAY COMPANY.
WEST JERSEY & SEASHORE RAILROAD COMPANY.

Article ______________________

Sec. No. ________ Inventory Acct. No. ________

Bin No. ________ Stock Book No. ________

STOCK INVENTORY—ORDER CARD.

| On Hand. | | Ordered and Received. | | | Price. |
|---|---|---|---|---|---|
| Date. | Quantity. | Req'n. | Quantity. | Date. | |
| | | | | | |

Fig. 2 —M. P. 49: Record of Deliveries.

Pennsylvania Railroad Company.
PHILADELPHIA, BALTIMORE & WASHINGTON RAILROAD COMPANY.
NORTHERN CENTRAL RAILWAY COMPANY.
WEST JERSEY & SEASHORE RAILROAD COMPANY.

FROM ________ MATERIAL ORDER.

TO ________ ________ 190

| DESCRIPTION OF MATERIAL. | WT AND QUANTITY | PRICE PER UNIT. |
|---|---|---|
| | | |

Enter on Each Card Items Chargeable to One Account Only.

CHARGE TO ________

COMPLETED ________ 190 ________ Foreman.

Fig. 8 —M. P. 151: Material Order.

PENNSYLVANIA RAILROAD COMPANY
Philadelphia, Baltimore & Washington Railroad Company.
Northern Central Railway Company.
West Jersey & Seashore Railroad Company.

RECORD OF MATERIALS ORDERED AND RECEIVED AT ________ SHOPS ________ 190__

| DATE ORDERED | CARD NO. | ORDER OR REQ. NO. | QUANTITY | | DESCRIPTION OF MATERIAL | FROM WHOM RECEIVED | | | DATE RECEIVED | BILL | | HOW RECEIVED | MANIFEST | | | F. O. B. AT | FREIGHT OR EXPENSE | PRICE PER UNIT | NET PRICE AS PER FORM "C" | WEIGHT | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ORDERED | RECEIVED | | NAME | ADDRESS | POINT OF SHIPMENT | | FORM "C" NUMBER | MONTH CHARGED | | NO. | DATE | CON | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |

Fig. 4.—Form M. P. 182, with M. P. 226, Storekeeper's Permanent Record.

PENNSYLVANIA RAILROAD COMPANY.
PHILADELPHIA, BALTIMORE & WASHINGTON RAILROAD COMPANY.
NORTHERN CENTRAL RAILWAY COMPANY.
WEST JERSEY & SEASHORE RAILROAD COMPANY.

Report of Material in Stock at ________________ Shops, 19____

| | ARTICLE | MONTH | ON HAND | PRICE | REC'D | CONS'D | TRANS'D | ORDERED | | | ARTICLE | MONTH | ON HAND | PRICE | REC'D | CONS'D | TRANS'D | ORDERED | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Quantity | Req's | | | | | | | | | Quantity | Req's |
| Invy. Acct. No. | | Jan. | | | | | | | | Invy. Acct. No. | | Jan. | | | | | | | |
| | | Feb. | | | | | | | | | | Feb. | | | | | | | |
| Stock Book No. | | March | | | | | | | | Stock Book No. | | March | | | | | | | |
| | | April | | | | | | | | | | April | | | | | | | |
| | | May | | | | | | | | | | May | | | | | | | |
| Location | | June | | | | | | | | Location | | June | | | | | | | |
| Sec. Bin. | | July | | | | | | | | Sec. Bin. | | July | | | | | | | |
| | | Aug. | | | | | | | | | | Aug. | | | | | | | |
| How Priced | | Sept. | | | | | | | | How Priced | | Sept. | | | | | | | |
| | | Oct. | | | | | | | | | | Oct. | | | | | | | |
| | | Nov. | | | | | | | | | | Nov. | | | | | | | |
| | | Dec. | | | | | | | | | | Dec. | | | | | | | |
| Invy. Acct. No. | | Jan. | | | | | | | | Invy. Acct No. | | Jan. | | | | | | | |
| | | Feb. | | | | | | | | | | Feb. | | | | | | | |
| Stock Book No. | | March | | | | | | | | Stock Book No. | | March | | | | | | | |
| | | April | | | | | | | | | | April | | | | | | | |
| | | May | | | | | | | | | | May | | | | | | | |
| Location | | June | | | | | | | | Location | | June | | | | | | | |
| Sec. Bin. | | July | | | | | | | | Sec. Bin. | | July | | | | | | | |
| | | Aug. | | | | | | | | | | Aug. | | | | | | | |
| How Priced | | Sept | | | | | | | | How Priced | | Sept. | | | | | | | |
| | | Oct. | | | | | | | | | | Oct. | | | | | | | |
| | | Nov. | | | | | | | | | | Nov. | | | | | | | |
| | | Dec. | | | | | | | | | | Dec. | | | | | | | |

Fig. 5 —Form M. P. 50: Stock Book.

PENNSYLVANIA RAILROAD COMPANY.
PHILADELPHIA, BALTIMORE & WASHINGTON RAILROAD COMPANY.
NORTHERN CENTRAL RAILWAY COMPANY.
WEST JERSEY & SEASHORE RAILROAD COMPANY.

REGISTER OF REQUISITIONS.

| Register No. | Req'n. | Shop. | Date Rec'd. | Sent to | Date. | Wanted. | Filled. | Car No | REMARKS. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

Fig. 3 —Form M. P. 226.

*No.* ________ *Register No.* ________

THE PENNSYLVANIA RAILROAD COMPANY.
PENNSYLVANIA RAILROAD DIVISION.
MATERIAL SHEET.

*SUPERINTENDENT M. P.*
*Altoona, Pa.* *ALTOONA, PA.* ________ *190*

*Please ship to P. R. R. Co., care* **Master Mechanic, Altoona, Pa.,** *for use of* **Altoona Machine Shop,** *the following material and charge* **Altoona Machine Shop Account.**

*Approved and sent to* ________ ________ *Supt. M. P.*

________ *Master Mechanic*

*Approved:* ________ *Supt.*

| Quantity | MATERIAL REQUIRED ACCOUNT No. ________ | Wanted |
|---|---|---|
| | Make one entry on sheet | |

SUPPLIED. By No. ________

| Date | Quantity | Weight | Rate | How Sent | REMARKS |
|---|---|---|---|---|---|
| | | | | | |

*Completed* ________

Fig. 6 —Form M. P. 291 for Outside Requisition.

PENNSYLVANIA RAILROAD COMPANY.
PHILADELPHIA, BALTIMORE & WASHINGTON RAILROAD COMPANY.
NORTHERN CENTRAL RAILWAY COMPANY.
WEST JERSEY & SEASHORE RAILROAD COMPANY.

________ ALTOONA MACHINE SHOPS. ________ *190*

We have this day sent to your address the following articles:

| How Sent | Order No. | DESCRIPTION OF ARTICLES | Rate | Amount | How Packed |
|---|---|---|---|---|---|
| | | | | | |

Received, ________ 190

NOTE.—This Manifest must be carefully compared with the articles received, and the same properly receipted and returned to the Storekeeper shipping the material. In the event of any discrepancies in weight or count, however, the same should be noted in red ink on the face of the Manifest and returned to the Office of Superintendent Motive Power.

________ STOREKEEPER.

Fig. 7—M. P. 7: Storekeeper's Notice to Consignee.

where material leaves the storehouse not to return, it is issued on the presentation of a material order like that shown in form M. P. 151. (Fig. 8.)

This order is presented at the storeroom signed by the foreman of the department where the work is to be done and the material is issued, and the storehouse connection with the same ends then and there. It often occurs, however, that the storehouse puts in a requisition for some article manufactured in the shop from raw material held in store. In this connection a special form, M. P. 271, is used to obtain material manufactured at the works, which is used in the stock order system. Instead of ordering by name only, a system of shop order numbers is used, and when an article is to be manufactured, the M. P. 271 is issued and, under the words, "Charge to," a number is placed, and all labor and material necessary is charged to that number. This serves to avoid confusion where two or more orders may exist for the same kind of articles; that is, articles having the same name, but differing slightly in character. Suppose, for example 100 two-gallon cans are wanted. A requisition on the tinshop is made for them on M. P. 271, given a shop order and sent out to be filled. The foreman of the tin shop then fills out the material order, blank No. 151 (or he may use the space at the bottom of M. P. 271 if he pleases), for the tin, bail handles, wire, ears, etc., that will be needed, and when they have been received, this material order is sent to the shop clerk. When completed, the cans are delivered to the storehouse and entered as new material; while the unit price for the same is made up by the shop clerk from the original cost of the material and the piecework prices of labor, and this is used as the unit price for the manufactured article, and the latter is charged to the consuming department at this rate.

Form M. P. 151 (Fig. 8) is also used where the charge will be against what is known as a closed account; that is to say where no shop bill will be rendered, as in the case of the replacement of a broken window pane, or for tools and supplies to locomotives and the like.

This system runs along smoothly when everything is working under normal conditions, but provision must also be made for abnormal conditions which will demand a certain amount of flexibility, in order that the necessities of such cases may be met as they arise. It may happen that a sudden demand for large quantities of a certain article will exhaust the whole stock on hand. For such emergencies a special card similar to the bin card M. P. 48 is provided and a special requisition can be sent in to be filled at once. To prevent over ordering and to serve as a check on the supplies, the requisition is checked by the superintendent and given a number, which is written on it, and under which it is identified in the register of requisitions, the receipt book and other places where reference is made to it. In the matter of scrap the storehouse has little to do, for while it does handle some old material, it is only that which is utilizable, and scrap, pure and simple, is handled by each department for itself.

The storehouse proper occupies a portion of the first and second stories of a brick building standing on the eastern edge of the grounds, that also houses the physical and chemical testing laboratories, and the offices of the master mechanic, the shop clerk and the storekeeper himself. An elevated platform along one side of the building gives convenient shipping facilities, but it must not be thought that all material is sent out from this point, or that everything is kept within the rather narrow limits of this building. The storehouse itself contains, for the most part, the higher priced and light manufactured articles, such as brass work, nails, screws, rope and the like.

Scattered over the premises there are a number of storage places where heavy material is kept, each in charge of an attendant, just as in the regular storehouse. Here the bin cards are filed in drawers or other places sheltered from the weather, but the records are maintained in exactly the same way, it being manifestly impossible to conveniently arrange for cards attached to such articles as drawbars, driving wheels and the like, while the permanent record of the stock appears in M. P. 50 in the storekeeper's office.

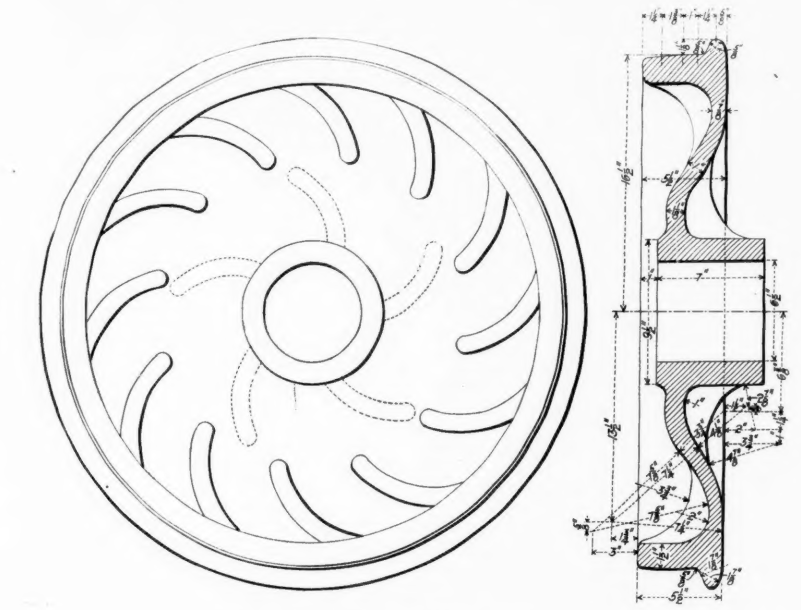
In the case of the pig and scrap used in the foundries, the records of receipts and disbursements are kept by the foundry foreman who reports the same to the storekeeper. The storekeeper is thus put in possession of the inventory record and can regulate the monthly requisitions accordingly.

In all there are about 90 employes in the storekeeper's department, including the clerical force in the office, the attendants, porters, shipping clerks and messengers.

When it is considered that Altoona is the distributing point for a circle of smaller points extending from Jersey City to Pittsburg and that supplies are sent not only to the various branches of the motive power department but to those of the transportation and maintenance-of-way as well, and that there are over 25,000 items listed, it will be seen that the whole system is exceedingly simple and must be efficient in order to operate at all. The storekeeper can tell at a moment's notice on any day of the month as to the exact condition of the stock of any item, while the monthly record of stock on hand keeps the management posted as to the value of what is carried. The storekeeper is merely a handler of material. He had nothing whatever to do with the fixing of prices, as this is done either by the purchasing agent through the bills that are rendered, or by the shop clerk who adds to the cost of raw material that of piecework price of the labor involved in working it up. But even though relieved of this portion of the work, the fact that all records even to minute details of the supplies used by a road like the Pennsylvania can be kept on what practically amounts to two cards and two form books, speaks volumes for the care and skill with which the system has been developed.

### A Single Plate Cast-Iron Wheel.

The accompanying drawing shows a new form of single plate bracket wheel which has been designed by the Louisville Car Wheel and Railway Supply Company, Louisville, Ky. More light on the car wheel question is interesting at this time in view of the probable adoption of standard designs for cast-iron wheels under 40-ton and 50-ton cars, by the Master Car Builders' Association at the convention next week. The single plate wheel has practically gone out of use since the introduction of heavy cars and the efforts of the wheel makers to design a satisfactory wheel to meet the more severe service conditions imposed by the heavy equipment have all been along the line of double plate. wheels. The proposed standard designs are double plate wheels. Particular attention has been paid to strengthening the flange and distributing the metal so as to prevent seams at the root of the flange as far as possible. In the single plate wheel here shown the plate is a continuation of the flange and the tread is supported by radial brackets, whereas in the proposed double plate wheel the inside half of the tread and the flange are supported on brackets. A larger amount of metal is put in the root of the flange of the single plate wheel, and at the same time the tread is made of nearly uniform thickness. The brackets on the inside and outside of the plate meet directly above the point of contact of the tread on the rail and this gives a stress in almost a straight line through the plate to the hub. All of the sections in the wheel have been made heavy enough to withstand the maximum stresses to which they might be subjected and at the same time no unnecessary metal has been put in. The makers claim that this design is stronger than the common form of double plate wheel, as shown by comparative drop and thermal tests on the two types of wheels cast from the same iron.



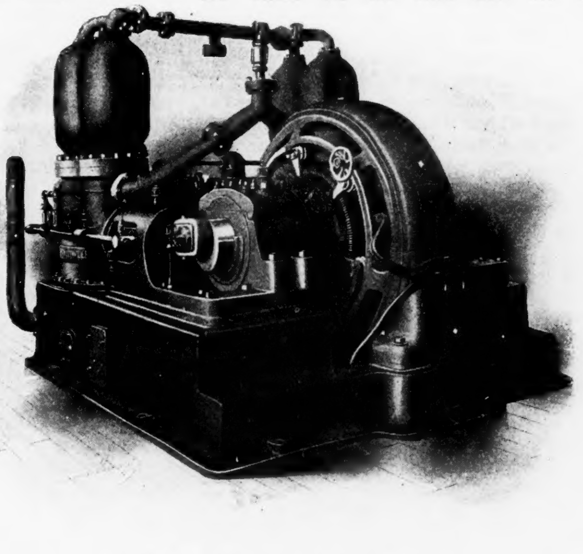
Single Plate, Bracket Car Wheel.

### High-Speed Motor-Driven Pump.

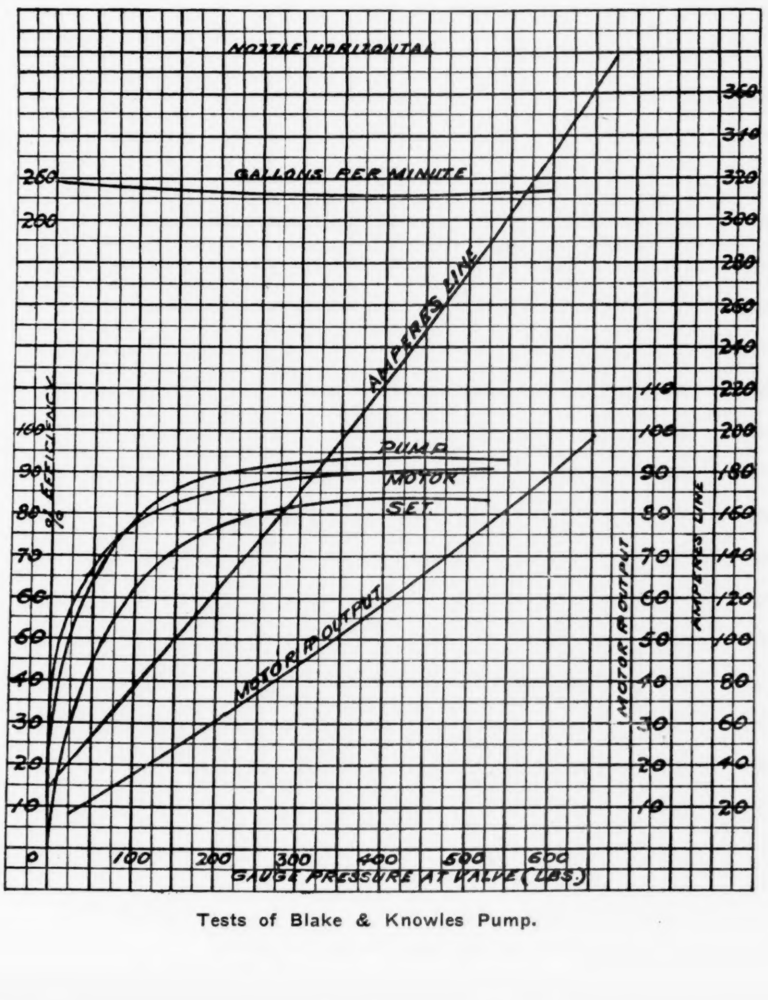
Electric-driven pumps have had one drawback, i.e., the necessity of using toothed gearing, belts or other devices to transfer the power from the motor shaft to the slow moving crank-shaft of the pump. In the pump illustrated herewith these objectionable features have been eliminated by connecting the pump plungers to cranks mounted directly upon the shaft of the motor. This pump has a capacity of about 250 gallons per minute against 1,000 ft. head when running at a speed of about 300 r.p.m. The mechanical efficiency of the pump is over 93 per cent., approximating closely to that of the highest types of large steam pumping engines. The pump is the duplex type with the cranks at opposite ends of the motor-shaft set at right angles to each other. The plungers are outside-packed and the two plungers of each pump are connected by side rods. The plungers are 3½ in. in diameter and have a stroke of 5½ in. The pump is driven by a 100 h.p. General Electric motor. The results of a test are given in the accompanying table. The volume of water pumped was measured by means of a calibrated Freeman nozzle and all gages were tested before and after the test by means of a weight gage tester. The pressure at the nozzle was measured by a mercury column connected to a piezometer chamber.

*Test of a Blake-Knowles High-Speed Pump.*

| | —Pump— | | | | ——Efficiencies—— Per Cent. | | |
|---|---|---|---|---|---|---|---|
| Rev. per Minute. | Motor Input. Watts. | Gallons Deliv'd. | Press., Lbs. | Pump H. P. | Motor and Pump. | Motor Alone. | Pump Alone. |
| 280 | 28,800 | 237 | 110 | 32.63 | 78. | 86.5 | 90.1 |
| 280 | 40,600 | 237 | 215 | 48.94 | 82.2 | 89. | 92.36 |
| 280 | 52,550 | 235 | 321 | 62.25 | 84.4 | 90.1 | 93.66 |
| 280 | 60,200 | 234 | 425 | 74.53 | 84.3 | 90.9 | 92.74 |
| 309 | 58,800 | 232 | 496 | 71.79 | 83.3 | ... | .... |



Blake & Knowles High-Speed Pump.




Tests of Blake & Knowles Pump.

The pump and motor are mounted on a rigid box-girder frame and the unit is self-contained and occupies a relatively small space. This type of pump has lately been introduced and is built by the Blake & Knowles Steam Pump Works, New York City, in capacities of from 200 to 4,000 gal. per minute, and for heads varying from 100 to 2,000 ft. One of these pumps operated by a direct-current motor will be exhibited in the space of the General Electric Company at the St. Louis Exposition.

### The Market Value of Inferior Woods.*

During the early history of the lumber trade the consumer felt at liberty to order almost anything, with a reasonable assurance of getting it. There was no question on the part of the manufacturer but that he could produce almost any kind of lumber for which he might receive an order. Take the example of white oak—and the same will be true of pine before long, and has become true of white pine—the consumer can no longer go to the manufacturer with reasonable assurance of getting what he wants. This is true to a large extent because of the increase in the demand and an even proportionately greater decrease in the supply of forest products, and the situation is fast assuming a phase of what the consumer can get as distinguished from what he wants. To take a specific case, it was an easy thing for the purchasing agent of a railroad company to go to a manufacturer ten or fifteen years ago, or even later, and make a contract for two years for 800,000 ties. To-day the manufacturer is not in a position to accept orders for high grade material of this description, but to a limited extent he can agree to furnish any of such material as the quality of his timber enables him to supply.

The question of the use of inferior woods has for some time been prominent in the work pursued by the bureau of forestry. We have tried to keep in mind the relations which existed between the use of high-grade woods and the possible substitution of lower grade timbers for different purposes. The buyer has become accustomed to certain qualities possessed by high grade woods, such as strength, ease of finishing, long life and other qualities which go to make up a high grade material, but the time has arrived when he is no longer in a position to get such material easily. We are constantly receiving inquiries such as these: "Please tell us what we can do with beech." "Is Western hemlock any good?" The consumer has been accustomed to using a great deal of timber which he did not have to question. He must now use materials of which he knows practically nothing. This is true also of the seller. He wants to get the greatest return for the material he has to sell. If he can put the product in the most attractive form he is going to have a material he can sell for the most money. To take a concrete example, questions concerning gum and loblolly pine are coming to the front more and more. Makers of cars, and others, are asking regarding the value of inferior timbers for car sills and structural uses of all kinds. The owners of gum lands ask what their gum is worth and how they may realize on it to the best advantage. We can see in this an increasing in-

*Extract from a paper by Hermann Von Schrenk, read before the National Lumber Manufacturers' Association.

terest in and demand for these inferior timbers; and the question is what we can do to establish more definitely the quality and value of each for certain uses.

The three problems we have started to investigate are, briefly:

1. To determine what the strength values of the various inferior timbers are:

2. What the lasting powers, both in the natural state and when treated chemically are.

3. How more economically to use the waste products of both low grade and high grade material, thus bringing about the utilization of all the wood in the tree, including tops, branches and slabs.

The preservation of wood, while practiced a great many years, both in this country and abroad, is still in such a chaotic state that very few know practically what to do. If you were to consider the following problem: "In connection with our saw mill we want to put up as cheap and reliable a plant as possible whereby we can preserve a certain wood, increase its hardness, increase its resisting powers to decay, decrease its tendency to warping and checking—how can we do it? What process shall we use?" If you were to ask a question like that, while there are a great many systems on the market, patented and otherwise, there has been too little effort to determine their exact value and whether they can be absolutely depended upon. What we are trying to do is to test the various forms of preservative processes used both in this country and in Europe, to test the relations between strength and chemical treatment of methods for increasing the stiffness. We are starting in these investigations in the South with gum, beech, loblolly pine and red oak; and on the Pacific Coast with Western hemlock and certain others of the market timbers in use there.

Regarding the strength of timbers, there have been a great many tests made, and the test values of timbers may be found occupying a large amount of space in the periodicals. Still these tests are of such a character that it is difficult to depend upon them. They have not been made with much system. The specimens have been taken without regard to the character of the test to be made. Many woods have received a reputation for being stronger than they are, which has hurt them when they have failed to come up to the expectations; other woods have been classed too low. I have at hand a few of the results in a preliminary form which we have obtained during the past year, and will read them.

Loblolly pine has not only a wide range of growth, but a wide range of structural merit. It is found locally in the markets of Washington and Norfolk under the name of Virginia pine, in small sap sticks 8 in. x 8 in. or 10 in. x 10 in., showing almost entirely sapwood of such a rapid growth that sometimes four rings occur in three inches. This is a second growth timber and usually very knotty. The same species occurs in the Charleston market and from there is shipped to Philadelphia and the North under the name of North Carolina pine and shows a large sized lumber, fairly free from knots, somewhat close ringed and of a high order of structural merit. As a tree it is prolific, and architects may expect to find it on the market for an indefinite period.

The chief objection to loblolly pine is that, being usually sapwood, it decays rapidly when exposed under certain conditions. It is, however, a timber that may be treated with preservatives very successfully. Some difficulty is experienced in preventing the wood from staining in the South Atlantic States, but if the timber is kiln dried it retains the pleasing grain and the clear, white finish to be found in the sapwood of the species. It is consumed very largely in the Philadelphia market for joists and mill construction.

Engineers have been for a long time specifying longleaf pine as the standard material for construction, and it is the opinion of most of them that a wood of quick growth has little merit. It is undoubtedly true that there is no structural wood that approaches longleaf pine for srength and durability, but for indoor use or for service in which severe shocks do not come on timber this quick growth loblolly pine offers one of the cheapest and most desirable building materials. Let us have some conception of the relative strength of joists of longleaf and loblolly pine. Let us compare the loads which would rupture two air dry joists 8 in. x 14 in. in cross section and 16 ft. span. One joist is of longleaf pine of good, merchantable quality, showing two-thirds heart on faces, free from shakes that show on the surface or through shakes and unsound knots. The other joist is North Carolina loblolly pine of square-edge grade, showing sap on all faces, free from through shakes or unsound knots, but of rapid growth. The longleaf pine joist will weigh 700 lbs. in an air dry condition and contain 133 lbs. of water. The North Carolina loblolly joist will weigh 500 lbs. and when air dry will contain 87 lbs. of water. The longleaf pine joist will stand 44,650 lbs. center load before failing and will deflect 2¼ in. at the time of failure. The loblolly pine joist will carry 32,650 lbs. at the time of failure and will deflect 3 in. just before failing. To state the matter in another way, if the loblolly pine joist is 8 in. x 14 in. in cross section the longleaf pine joist will have to be 8 in. x 12 in. in cross section for the same strength.

What shall we say of the red fir joist? The red fir is a wood that is found from the southern part of the State of Oregon up to Vancouver; from the west slope of the Cascade Mountains to the coast. Fully 90 per cent. of the timber in Oregon west of the Cascade Mountains is this red fir, which is sometimes called Douglas spruce, Oregon pine and Oregon fir. It grows to a large size, with old trees 10 ft. in diameter. The wood varies between a somewhat coarse-ringed growth to a hard, fine-ringed variety. The wood, however, is never, even in the fine-ringed variety, as hard as longleaf pine of an equal rate of growth.

It is found in the red and yellow colors. The two colors may exist in the same tree. It is the impression among lumbermen that in a locality of thick, dense growth, where there is a rich soil and an abundance of rainfall, the yellow color is produced in the tree, while the red color is more common in the dryer districts with poorer or more rocky soil. It is also a belief that the yellow wood is the wood of an older growth and from larger trees, while the red color is apt to be a second growth. There is a great difference in the relative hardness of the rings of red fir and also in the shrinking qualities, so that the wood when dry is apt to be of a ribbed character, with hard rings standing out from the softer rings. The wood is more durable than pine and less than longleaf pine. The great length in which the wood can be sawed perfectly free from blemishes and clear from knots renders it available for special uses. It is already a competitive wood in the markets of Chicago and as far east as Pittsburg. What will be the strength of an 8 in. x 14 in. red fir joist compared to joists of longleaf and loblolly pine, the red fir being of merchantable grade, being of sound lumber, free from shakes, large, loose or rotten knots, allowing sound knots, pitch seams, sap on corners one-third width and one-half thickness? This air-dry red fir joist will carry 30,500 lbs. at the time of failure, and will deflect 5 in. It will weigh 400 lbs. and contain 62½ lbs. of water.

The Western hemlock has suffered in reputation because of Eastern hemlock. The Western hemlock grows in large sizes up to 13 ft. in diameter, with a height of 250 ft., and is found in Washington, Oregon and Vancouver, intermixed with red spruce and cedar. It is a vigorous growing tree and after the red fir has been cut down most of the young growth seems to be hemlock. It is not so white or hard as Pennsylvania hemlock. Perhaps it approaches more the wood that is brought from Canada, being softer. It has a distinct odor and is practically immune from the attacks of insects. At the present time it is cut and appears on the market as second grade red fir, not usually being cut or sold under its own name. It has been used for trestles, locally by mills on the Pacific Coast and furnishes a very desirable and pleasing finished wood. An air-dry joist of hemlock of merchantable grade will carry 28,300 lbs. before failing, and will deflect 1½ in. It will weigh 500 lbs. and contain 112 lbs. of water.

Summing up, then, we may say of these four species—longleaf pine, loblolly pine, red fir and hemlock—that the relative carrying capacity of an 8 in. x 14 in. x 16 ft. joist is in proportion of the following numbers: 82, 62, 72½ and 52.

The sizes of the joists for equal strength will be as follows: Taking the width of the joist as 8 in. and the span 16 ft.: 14 in. for longleaf pine, 16 in. for North Carolina loblolly pine, 16 in. for red fir, and 18 in. for hemlock, the weight per 1,000 ft., B. M., of perfectly dry timber will be as follows: 3,820 lbs. for longleaf pine, 2,580 lbs. for North Carolina loblolly pine, 2,120 lbs. for red fir and 2,170 lbs. for hemlock.

The great problem of immediate interest to every one is greater economy in the use of all kinds of material; in other words, an increased getting together on standard sizes of all forms of material between the manufacturer and the consumer ought to come about. The bureau of forestry began some years ago to investigate the tie proposition as one of the most demoralized forms of the lumber trade in the United States. Every railroad buys what anybody will sell it, simply for convenience, but there has been no reason for any definite specification hitherto, because of the great cheapness and quality of the material. With the increasing expense and difficulty of securing ties and the increasing use of sawn ties, it has been necessary to adopt some form of specification.

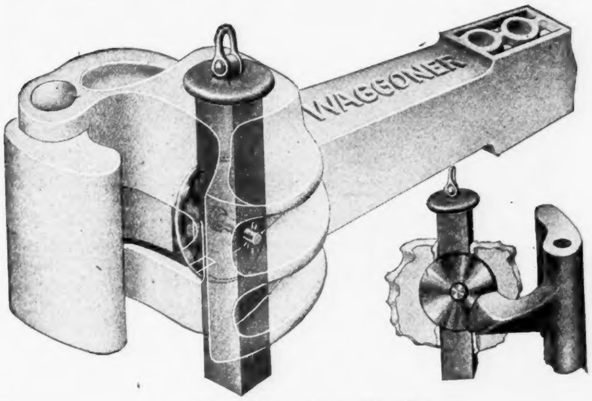
Furthermore, this problem is one of dealing with the most suitable use to be made of any material. The idea is gaining that certain kinds of material are to be saved for certain industries. We have been trying to impress upon the railroads in the Mississippi Valley that they do not want to use white oak ties—that they ought to leave that wood to industries depending upon it and use for their purpose cheaper grades of material.

Another point to be considered is unification of trade names and terms. A great deal of dispute arises because of the confusion in this regard in different kinds of timber and in different countries. I was impressed while in Europe last summer with the feeling of uncertainty which existed in regard to names of American lumber products. They were buying Oregon pine and

were getting Douglas fir, not realizing that both meant the same timber. I would suggest a campaign of education in regard to terminology of woods, which need not go into the finesse of material. For instance, certain kinds of red fir look much like hemlock and there is not much use in splitting hairs. But on the main proposition there should be a terminology established, so that the buyer on the west coast, or the east coast, or in China, when a man says "I will sell you a car of A, or B, or C, or D," will know just what he is going to get.

## The Waggoner Coupler.

A new design of coupler is shown herewith, the principal feature of novelty being the locking device. It will be seen that a simple straight pin is used which has attached to it a revolving disk, 5½ in. in diameter and ⅞ in. thick. The latter is designed to provide a large and constantly changing wearing surface, and to obviate any creeping up of the pin, the working of the knuckle against the disk simply causing it to revolve. The position of the pin and disk is such that the plane of the latter forms an acute angle with the axis of the coupler. The back of the knuckle is made with an incline, which permits it, in closing, to slide under the disk, raising the pin. When the latter drops back into position, the knuckle bears against the side of the disk. Therefore unlocking cannot occur without lifting the pin. Also the action of the disk is such as to provide practically an anti-friction element between the knuckle and pin.



The Waggoner Coupler.

The lock is always set when the pin is raised. It is claimed that the weight of the pin and disk will throw out the knuckle ready for coupling, so that to open the knuckle for coupling it is only necessary to raise the pin and drop it. To uncouple, the trainman need only raise the uncoupling lever to the locking point of the pin and let it drop, this operation setting the disk on top of the knuckle. The pin remains in the uncoupling position until the parting of the cars opens the knuckle, permitting it to drop to the coupling position. This does not occur, however, unless the knuckle is opened to its total outward movement, thereby preventing its occurrence in the case of any slight movement of the knuckle due to the jarring in passing over frogs and switches. The formation of the coupler wall around the top and bottom of the pin on three sides is such as to form a back-stop, relieving the pin of strain, and avoiding possibility of its being bent.

The coupler was patented on May 10th by Mr. A. E. Waggoner, of Grand Rapids, Mich., who expects to have it on exhibition at the M. C. B. convention.

## Lengthened Parlor Cars of the Monon.

The Chicago, Indianapolis & Louisville has recently rebuilt two parlor and dining cars at its Lafayette shops, the work of rebuilding including the lengthening of the cars from 59 ft. 6 in. to 72 ft. 1 in. over sheathing, or 13 ft. 5 in. longer than originally built. The bodies of the cars were cut in two between the transom and needle beam and the halves separated far enough to receive the 13 ft. 5 in. double splice-piece in the side sills. The two center sills were cut off near the center of the lengthened car, the shorter ends being discarded and new pieces 13 ft. 5 in. longer were substituted, giving but one splice. The two intermediate sills were removed from their position adjoining the center sills, turned end for end and spliced, and then placed adjacent to the side sills. Two additional intermediate sills, 5½ in. x 7¼ in., were applied, making eight sills in the new underframe, instead of six as formerly. A timber, 7¼ in. x 10 ft. 6 in., was fitted between the center sills at the splice and bolted securely to them by bolts spaced 20 in. apart. The splice on the old intermediate sills was strengthened by a timber 2 in. x 7¼ in. extending 4 ft. 6 in. each way from the center of the splice and, a timber 2 in. x 7¼ in. x 24 ft. long was bolted to the side sills, overlapping both of the splices on these sills.

The bridging is spaced from 13 in. to 15¾ in. centers throughout. There are two layers of deafening material ⅞ in. thick fitted between the bridging and the sills. The side sills are 6 in. x 8 in. and their top inside corners are rabbited ¾ in. deep and 1 in. from the side to receive the flooring. There are two layers of flooring, the bottom course being 1½ in. thick, with ends rabbeted out ⅝ in. on the under side, and the top overlapping the side sills to admit of more nailing surface and to form a better tie for the frame. A layer of three-ply paper was laid over the tops of the sills, on which the 1½ in. flooring was laid crosswise.

Instead of a wooden truss plank, as used in the old car, a 10 in. 15-lb. channel, 73 ft. long, was substituted. It rests on top of the lower floor directly over the side sill and is secured to the latter by ⅝-in. bolts with ⅜ in. x 2 in. hook ends, passing down through the sill and spaced 4 ft. apart. The hook, of course, rests on the top edge of the channel, and is held in place by a bolt which passes through the channel web 2 in. from the top of the channel. The channel is also bolted to the posts. The steam heating pipes are placed in the recess between the flanges of the channel. After placing the channel in position, the upper floor, which is ⅞ in. thick, was laid, its outer edge being rabbeted to fit snugly over the lower flange of the channel. Two body truss rods were added, being located 24 in. either side of the center of car. The anchor straps of the two outside truss rods lap over both sets of body transoms. The end sills are composite, the outer member being 3 in. x 8 in. oak, the inner member 4¼ in. x 8 in. oak, and the flitch plate ¾ in. x 8 in. The posts of the side frame are gained out ¾ in. on their outside edges for the sheathing.

The interior finish of the parlor end of the car was left unchanged. An entire new golden oak finish was put in the dining room and kitchen. The only change in the smoking room was to replace two stationary seats with four additional movable chairs, making eight chairs in all. Two revolving chairs were added to the parlor, also a reclining sofa and four chairs, on opposite sides, which can be enclosed with curtains.

The old dining room could only seat eight persons satisfactorily, while in the new one 12 people can be served without crowding. The cars are mounted on the original six-wheel trucks, which were strengthened to carry the increased weight. The weight of the old car was 91,800 lbs., and of the rebuilt car 108,400 lbs. We are indebted to Mr. Charles Coller, Master Car Builder of the Monon, for the foregoing information.

## Programme of the M. C. B. Convention.

The Master Car Builders' Association will hold its 38th annual convention at Saratoga Springs, N. Y., June 22, 23 and 24. Headquarters will be at the Grand Union Hotel, and the meetings will be held in the ballroom, which has been remodeled to give it good acoustic properties. The following programme has been arranged:

OPENING MEETING.

### First Session.

*Wednesday, June 22, 1904—10 a. m. to 1:30 p. m.*

Opening exercises:
Prayer,
President's address. . .10.00 a. m. to 10.30 a. m.
Intermission . . . . . . . . . .10.30 a. m. to 10.35 a. m.
To allow visitors to retire should they wish to do so, although all are invited to remain.
Reports of secretary and treasurer. . . . . . .10.35 a. m. to 10.45 a. m.
Assessment and announcement of annual dues; appointment of committees on correspondence, resolutions, nominations, obituaries, etc. . . . . . . . . . . .10.45 a. m. to 10.50 a. m.
Election of auditing committee . . . . . . . . . .10.50 a. m. to 10.55 a. m.
Unfinished business. . . .10.55 a. m. to 11.10 a. m.
New business. . . . . . . . .11.10 a. m. to 11.40 a. m.
Discussion of reports:
Standards and recommended practice. . . . .11.40 a. m. to 12.00 m.
Triple valve tests. . . . . .12.00 m. to 12.30 p. m.
Brake shoe tests. . . . . . .12.30 p. m. to 12.40 p. m.
Tests of M. C. B. couplers . . . . . . . . . . . . . . . .12.40 p. m. to 1.30 p. m.

Adjournment.

### Second Session.

*Wednesday, June 22, 1904—7:30 p. m. to 9:30 p. m.*

Topical discussions:
1. What are the advantages or disadvantages of 2-in. main steam pipe with 1⅝-in. steam hose. To be opened by Mr. J. J. Hennessey. . . . . . . . 7.30 p. m. to 7.50 p. m.
2. Advisability of the Master Car Builders' Assn. adopting standard contour lines for steam hose couplings with a view of having same interchangeable, upon the same principle as the M. C. B. coupler contour lines. To be opened by Mr. T. W. Demarest. 7.50 p. m. to 8.10 p. m.
3. To what extent does friction draft gear reduce repairs, expenses, etc. To be opened by Mr. E. B. Gilbert. 8.10 p. m. to 8.30 p. m.

Discussion of reports:
Standard location of third rail for electrical operation. . . . . 8.30 p. m. to 8.50 p. m.
Stenciling cars. . . . . . . . 8.50 p. m. to 9.10 p. m.
Coupling chains. . . . . . . 9.10 p. m. to 9.30 p. m.

Adjournment.

MIDDLE MEETING.

### First Session.

*Thursday, June 23, 1904—9 a. m. to 1:30 p. m.*

Discussion of reports:
Draft gear. . . . . . . . . . . . 9.00 a. m. to 9.20 a. m.

Stake pockets.......... 9.20 a. m. to 9.40 a. m.
Best preventive of rust on steel cars........ 9.40 a. m. to 10.00 a. m.
Rules of interchange, including report of arbitration committee and committee on prices for repairs of steel cars ...............10.00 a. m. to 11.30 a. m.
Outside dimensions of box cars ............11.30 a. m. to 12.00 m.
The use of steel in passenger car construction (An individual paper by Mr. Wm. Forsyth) ............12.00 m. to 1.00 p. m.
Cast iron wheels...... 1.00 p. m. to 1.30 p. m.
Adjournment.

## Second Session.

*Thursday, June 23, 1904—3:00 p. m. to 5:00 p. m.*

Topical Discussion:

1. To what extent will a more rigid inspection of car couplers at terminal points reduce accidents and repairs. To be opened by Mr. James Macbeth ............... 3.00 p. m. to 3.25 p. m.
2. The advantages and disadvantages of the different varieties of side bearings now in use. To be opened by Mr. L. H. Turner.... 3.25 p. m. to 3.50 p. m.
3. Cannot the present method of securing spring pockets to couplers for freight cars be improved upon? To be opened by Mr. J. S. Lentz... 3.50 p. m. to 4.15 p. m.
4. Brake-beams. The proper hanging of brake-beams to secure brake shoe clearance. To be opened by Mr. W. E. Fowler... 4.15 p. m. to 4.40 p. m.
5. Stronger draft gear for passenger cars. Wherein should present practice be modified? To be opened by Mr. H. LaRue....... 4.40 p. m. to 5.00 p. m.

Adjournment.

CLOSING SESSION.

*Friday, June 24, 1904—9:00 a. m. to 1:30 p. m.*

Discussion of reports on:

Air brake hose........ 9.00 a. m. to 9.30 p. m.
Rules for loading long materials .......... 9.30 a. m. to 10.30 a. m.
Steam and air line connections ...........10.30 a. m. to 11.00 a. m.
Tank cars ............11.00 a. m. to 11.30 a. m.
Conference with Interstate Commerce Commission ............11.30 a. m. to 11.40 a. m.
Subjects .............11.40 a. m. to 12.00 m.
Unfinished business:
Reports of committees on correspondence, resolutions, etc.........12.00 m. to 1.00 p. m.
Election of officers..... 1.00 p. m. to 1.30 p. m.
Adjournment.

## Railroad Shop Tools.

High-speed tool steel has been chiefly responsible for the important changes which have been made in the design of machine tools. By its use, both the depth of cut and the speed have been greatly increased. Machine tools which were designed 10 years ago and even five years ago are seldom strong enough to pull the heavy cuts possible with the new tool steel. In some cases, the weak point in the machine is the belt, while in other instances the gears, or tool post, etc., are the weak points.

Lack of belt power has been overcome by the use of electric motors which also offer a ready means for varying the speed of the machine without shifting belts. Cast-iron gears are now seldom used, their place being taken by cast, wrought and semi-steel cut gears. Tool posts, head stocks, beds, etc., have also been strengthened. In many cases, however, the extra weight has not been put where it will do the most good. In other words, many so-called "modern" tools are but the old style tools on a large scale.

Owing to the introduction of high speed steel and the more rigid construction of machine tools, it has been possible to greatly decrease the cost of doing certain classes of work in railroad shops, but the actual saving has not been so marked in railroad shops as in manufacturing shops. This is due to the fact that the size of the parts of locomotives and cars has kept pace with these advances in shop methods. That is to say, it requires proportionately more time to turn out a modern driving axle 10 in. in diameter by improved methods than it did ten years ago to turn out a 6 or 7 in. axle with the old tools. The cost and speed of removing one pound of metal is now much less, but a greater number of pounds must be removed from the same part than was hitherto necessary.

The machine tool art is still in a state of transition, but a description of the present state of the art will no doubt be interesting. The following descriptions are the beginning of a series of articles which are to appear giving examples of the machines used in all departments of railroad shops.

AXLE LATHES.

The double cutting off and centering machine shown in Fig. 1 is used for cutting off and centering axles and shafts of any diameter up to 12 in. The axles are held in place by two self-centering chuck jaws. The heads are adjustable along the bed. The heads are driven by a large cone of three changes of cross feed operating simultaneously or separately, as desired. Centering heads when furnished, have revolving spindles driven from a separate countershaft, and may be moved quickly in or out of position by means of convenient levers. To facilitate the handling of work the machine is furnished with the adjustable rollers, shown in the half tone. The countershaft for driving main heads has pulleys 20 in. in diameter for a 6-in. belt, with two speeds 250 and 350 revolutions per minute. The countershaft for driving the centering heads has pulleys 12 in. in diameter for a 5-in. belt, and makes 150 revolutions per minute. This machine is equipped with motor drive when so desired.

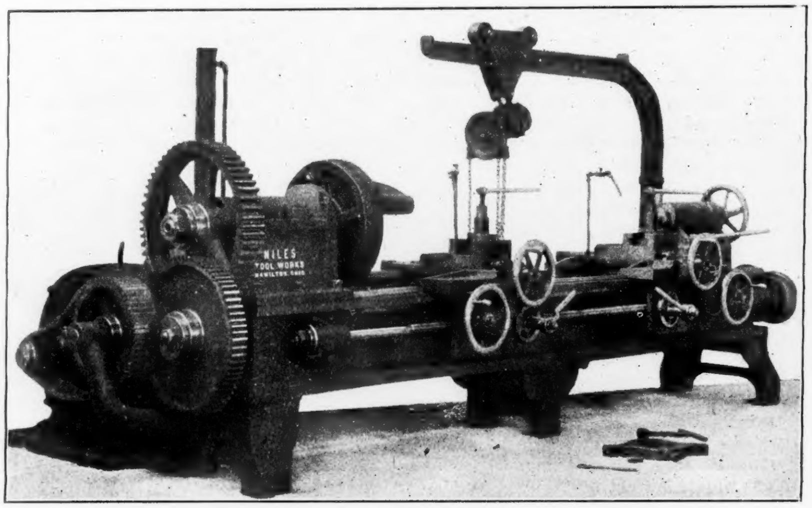



Fig 2—Niles-Bement-Pond Single Axle Lathe.

Fig. 2 shows the Niles-Bement-Pond extra heavy single axle lathe. This machine is driven by a direct connected No. 5 20 h.p. Westinghouse motor, through a Morse silent chain. The motor has a speed variation from 375 to 1,500 r.p.m. This lathe was designed for turning the heaviest locomotive axles. The swing over carriage is 12 in. and the maximum distance between centers is 8 ft. The axle is driven from the end of a double equalizing driver plate. The carriages have three changes of feed by a heavy lead screw, and positive gearing. Both carriages have opening nuts, quick hand movements and hand cross feed. The lathe is also provided with formers on the back, so that any desired contour to the axle can be secured.

An exceptionally powerful machine built by the Niles-Bement-Pond Company is shown by Fig. 3. This machine is known as the Niles No. 3 extra heavy double axle lathe. It is driven by a 20 h.p. motor having a speed variation of 2 to 1. This is a particularly rigid machine designed for use with modern high-power tool steel. The main gear is placed in the middle of the bed and carries on its face an equalizing driver-plate, which takes hold of both ends of the double axle driving dog. This allows an irregular

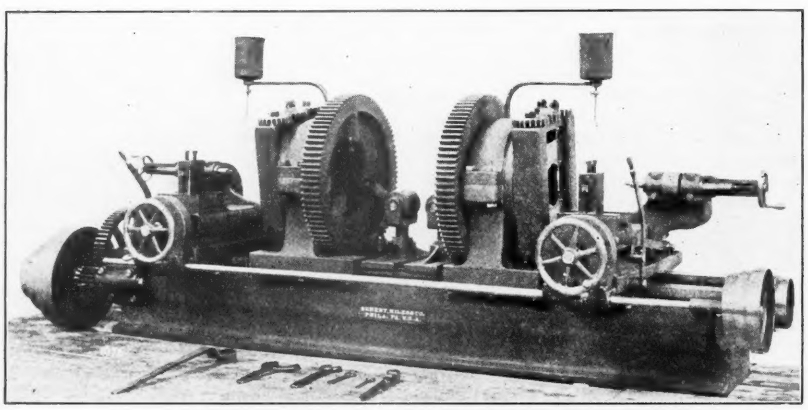


Fig. 1—Niles-Bement-Pond Cutting-Off and Centering Machines.

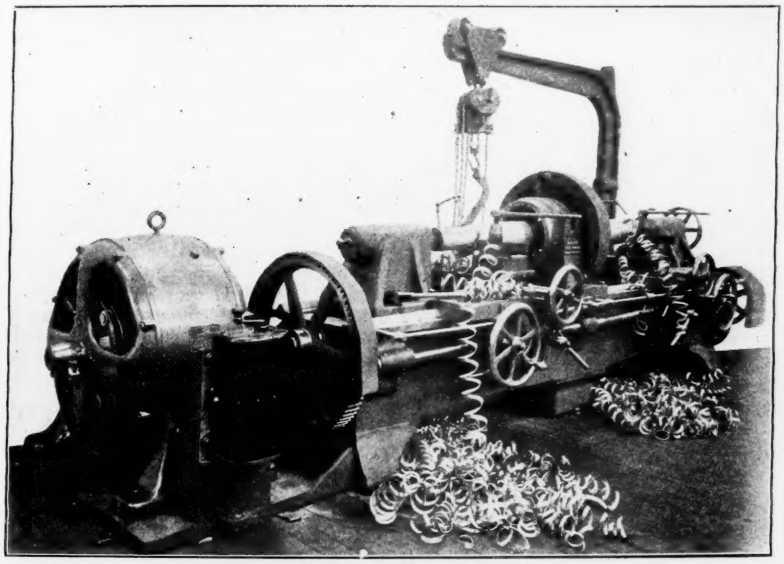


**Fig. 3—Niles-Bement-Pond No. 3 Double Axle Lathe.**

or crooked forging to revolve without setting up bending-strains. The axle is held on dead centers, both tail-stocks being adjustable and one having a sliding-spindle and hand-wheel.

There are two carriages having power-feeds by a right and a left-hand lead-screw positively driven by gearing. Lead-screw nuts, with an instantaneous automatic opening device, are placed in both carriages and released by set-collars on the rod in front. Quick movement and cross-feeds are made by hand. Lubrication of tools is provided for by a pump, jet pipes, reservoir, and collecting channels. A crane for lifting the axles in and out is placed on the bed. This crane has a convenient gripping and hoisting outfit, and is easily handled by one man. The opening in the center is 12½ in. in diameter, and the distance between centers is 8 ft. When it is desired to drive this machine by belt, a 30 in. diameter cone with three steps for a 5 in. belt is provided.

The Niles-Bement-Pond No. 6 extra heavy convertible center and end-drive axle lathe is shown in Figs. 4 and 5. When running at its full capacity it requires 60 h.p. to drive it. The driving pulley is 42 in. in diameter for a 10-in. belt, and it is driven either directly from a variable speed motor or by a two-speed countershaft. The tool posts and the carriages are of massive construction. Both the tailstock and the sliding-head are furnished with reinforcing pawls for taking the end thrust. The bed is 37 in. wide, 28 in. deep, and 15 ft. long, and is of box section, resting on a foundation its entire length. The driver, which is double and self-adjusting, has an opening 12 in. in diameter and may be placed in the center of the bed (Fig. 4), when turning both ends of an axle at the same time, or at one end (Fig. 5) when it is desired to turn the center of the axle. Carriages have power longitudinal feed variable from $1/60$ to ¼ of an inch through friction disks. The feed can be instantly changed from either carriage. The weight of this machine is 40,000 lbs.

*(To be continued.)*

## Fuel Economy.

BY GEORGE M. CARPENTER.*

It is a well-known and self-evident fact that the fuel account on all railroads is by far the largest single item of expense, and for this reason economy in its use is being practiced on all well-managed roads. Managements grasp at anything which might in their opinion lead to a less consumption of fuel, or, in fact, whereby they can make a better showing in any of their respective departments. Looking back only a few years at the cost to operate for a given period any department and comparing those results with what is now being obtained, we may feel inclined to ask why we should not be satisfied, and congratulate ourselves on our economical showing. What has brought about this higher degree of economy? Is it not simply the work of brains combined with a higher standard of education in general? If such is the case, since economical results are being obtained in other branches of the mechanical department, and we attribute these results to a more advanced stage of mechanical education, why cannot the same be applied to the saving of fuel?

To-day there is probably no practice of railroading where economy is more sought after, and the conditions which surround the situation so complicated, as in the use of coal. Much has been written and many devices and suggestions have been offered, the most of which has proven of but little or no value. Often that which is written is from a theoretical standpoint, and even though it be understood, the conditions involved may be such as to prevent the ideas being put into practice; therefore while the principles involved may be correct, they are valueless except as theories.

"Fuel economizers" have been offered and tried, only to be found impractical, for one reason or another, so that to-day in locomotive practice the mechanical world has faint hope of obtaining fuel economy through the use of mechanical devices. Suggestions meet us on every hand, and while we often perceive in them valuable points and put them into practice, expecting satisfactory results to follow, the usual result is an increase of engine failures, delayed trains, increased correspondence, and everybody asking "what's the matter?" So we again find ourselves back in the same rut as before, with engines steaming as well as formerly, delays no longer occurring, correspondence reduced to its normal proportion, and we acknowledge that all we have gained is the experience of having tried the other fellow's suggestions. Therefore, although these suggestions may be worthy of recognition, such experiences teach that they cannot be accepted unconditionally, consequently each road should have "thinkers" of its own to study closely the conditions peculiar to its own system, and they should work to that end and that alone.

The old adage tells us that if we wish to save money, we must first learn the value of a dollar. This same idea might be applied to the saving of coal; first learn what coal is and the laws which govern its burning, and thus learn its value. To-day fully 90 per cent. of our enginemen have absolutely no knowledge as to what coal is, what it contains or what is required to burn it successfully or economically. Where these conditions prevail, economy in the use of coal could hardly be expected. Enginemen are required to be proficient in their knowledge of every part of the locomotive and its

*Fuel Inspector, Nashville, Chattanooga & St. Louis R. R.

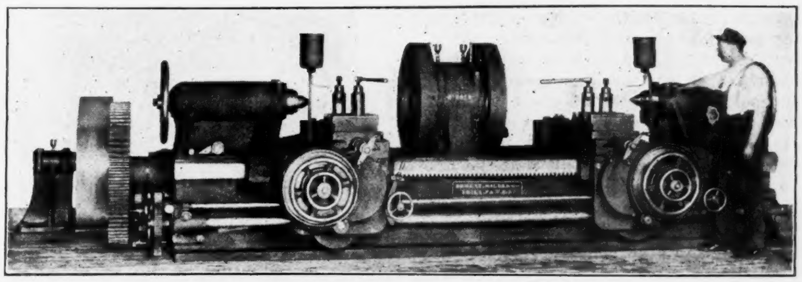


*Fig. 4.—Center Driven.*

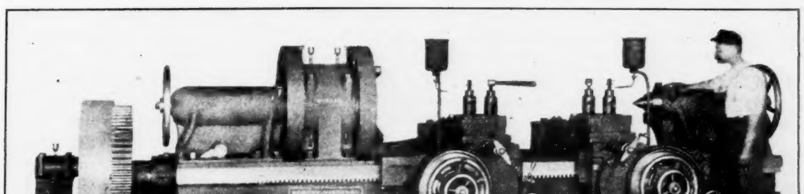


*Fig. 5.—End Driven.*

**Figs. 4 and 5—Niles-Bement-Pond Convertible-Drive Axle Lathe.**

attachments, and many of them are continually seeking to broaden their knowledge of their vocation, requiring time and study. Why should not some of this time be devoted to acquiring a more thorough knowledge of coal, and the laws which govern its combustion? It is daily being demonstrated on several of our larger railroads which have recently adopted the "education-in-coal" system among their enginemen, that great economy is being shown, and the approval of education along these lines is fast meeting with favor among many of our broad minded railroad managers and is considered by them as the most important step to be taken in fuel economy.

Railroads will find it to their advantage to have in their employ some one who is not only a practical engineman and fireman, but who has at some time made a study of coal, from its natural bed to the fire-box, all from a practical standpoint. He should visit as often as practicable the various collieries from which the coal is obtained and if necessary install inspectors who are familiar with coal and its preparation to oversee personally the loading of every car intended for his company, and to see that it is as free as possible from the many impurities and foreign matter which are too often the cause of engine failures and delays; also to see that the grade of coal is kept to a standard in accordance with contract. He should, furthermore, be capable of instructing enginemen as to what coal is and the conditions which should prevail in order to obtain the best possible results from its combustion. This requires no high degree of education and can be easily acquired by anyone possessing ordinary intelligence and devoting a little time to study. The duties above outlined do not by any means cover the requirements; still they are stepping stones to fuel economy. A clean uniform grade of coal, it matters not whether it be of the highest or of the medium grades, combined with a knowledge of what it is and the requirements to burn it properly, are bound to show a certain degree of economy.

It is an erroneous idea that the engine crew alone are responsible for the excessive amount of fuel consumed, or that they can attain to a high degree of saving without the concerted effort and support of the executive as well as the transportation and mechanical departments. Also, enginemen and firemen should be equally well informed on the subject and should work in harmony with each other, for with the fireman doing his utmost to save fuel and the engineman entirely indifferent as to the way the engine is run, the latter can, through his indifference, waste in five miles all that the fireman might have saved in 20; therefore the importance of both working to the same end.

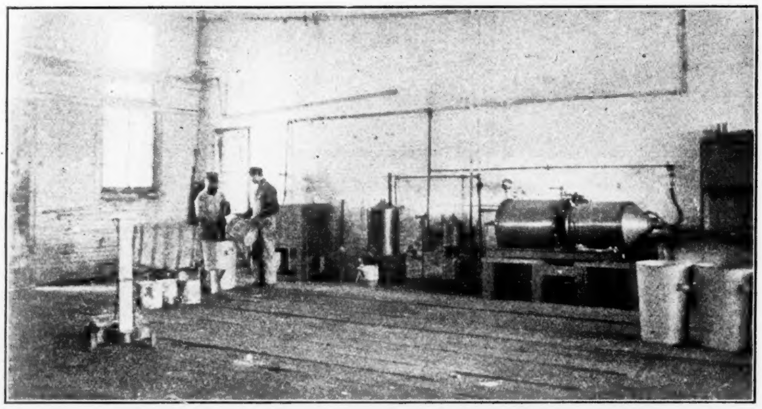
The duties of the traveling engineer and traveling fireman enter largely into the saving of fuel. They should obtain all information possible pertaining to the fuel used and study well its requirements, meantime making it a point to see that each engineman is striving to do his part by following any and all instructions given him along these lines. They should also study well the drafting of the engines in their respective classes (a feature too often neglected) and endeavor to have the draft adjusted to give the best possible results with the grade of coal furnished. As bituminous coal from various collieries varies in its general make-up, much better results can be obtained as a whole by separating as far as practicable the different coals, and drafting the engines in accordance with the particular coal used on the different divisions of the system.

Blows in the cylinders and valves and other leaks all cause a waste of fuel; and under any and all circumstances pop valves should be released as little as possible, as about 1 lb. of fuel is wasted for every 15 seconds the ordinary pop valve remains open. The efforts of master mechanics and roundhouse foremen should constantly be directed to repairing the leaks and blows which mean a waste of fuel and thus contribute their part toward the saving.

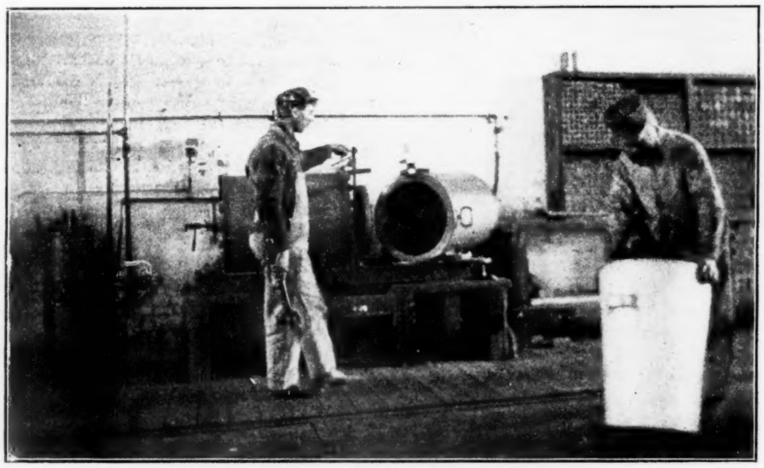
The transportation department may contribute very largely to the saving of fuel, for while ambitious to move at the smallest possible expense the largest number of cars, they must recognize the fact that each engine can do about so much and no more. To overload an engine, compelling it to double hills; stalling and slipping and lying on side tracks on accounts of being unable to make meeting points, all takes coal; therefore the co-operation of this department is needed if the best results are to be obtained. A railroad well known to the writer began some ten months ago to practice fuel economy from a common-sense standpoint. The general manager having realized that, in order to do this his personal efforts must be put forth, he at once impressed the heads of the respective departments with his intention and placed a competent man at the head of the "Fuel Saving Department." Imagine his surprise when on the first of the present month (June) he was informed that through the concerted efforts of all, a saving of over $70,000 had thus far been made; and in the same proportion at the end of the year a saving of over $100,000 would be shown as compared with the fuel expense for the preceding year; all of which is attributed to giving the coal situation the same attention as would be deemed necessary to give any other department where economical results are expected.

## The Grease Plant of the Chicago & North Western.

The accompanying illustrations show the plant used for making rod-cup grease at the Clinton shops of the Chicago & North-Western, at which place all rod-cup grease used on the system is made and pressed into stick form so as to be placed in the rod-cups without loss. When rod-cup grease was first used on this road, it was made in bulk and the enginemen got it from the storehouse in varying sizes and shapes. This practice not only resulted in considerable waste, but the grease was not in good shape to be used, thus taking considerable time to fill the cups. To overcome this wastefulness and to facilitate filling of cups a press was built to be operated by air. The press is made of two cylinder bushings, one 19½ in. and the other 18 in. in diameter.



Grease Plant of the Chicago & North Western.



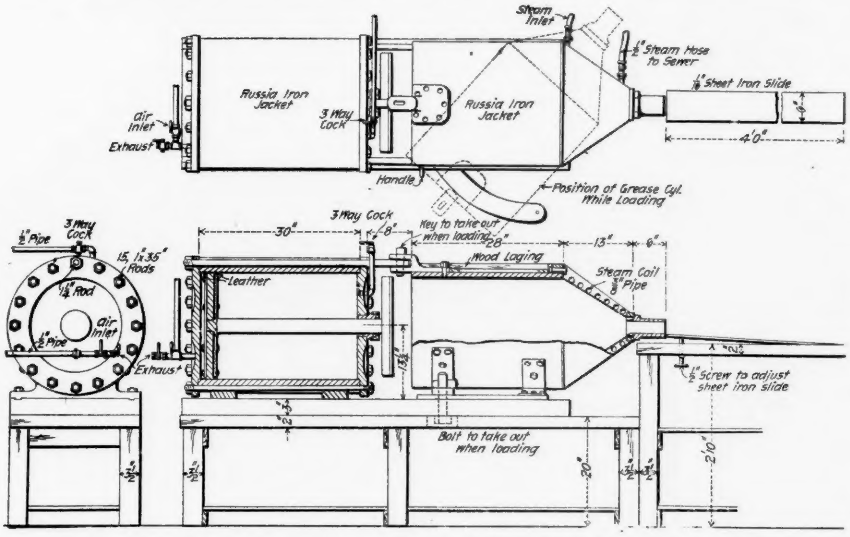
Grease Plant of the Chicago & North Western, Showing Compressor Cylinder Open.

The grease is made in the following manner: Caustic soda in pulverized form is mixed with water, tallow and valve oil according to a fixed formula. The caustic soda is dissolved in water the day before it is needed, so that it will be cold before being used. This caustic soda is placed in the 60-gallon air mixer "A," where it can be kept in continual motion until it is dissolved. The air mixer has a faucet in the bottom so that the fluid can be drawn into a bucket "B," which is gaged to the correct amounts required. The next day the rod grease is

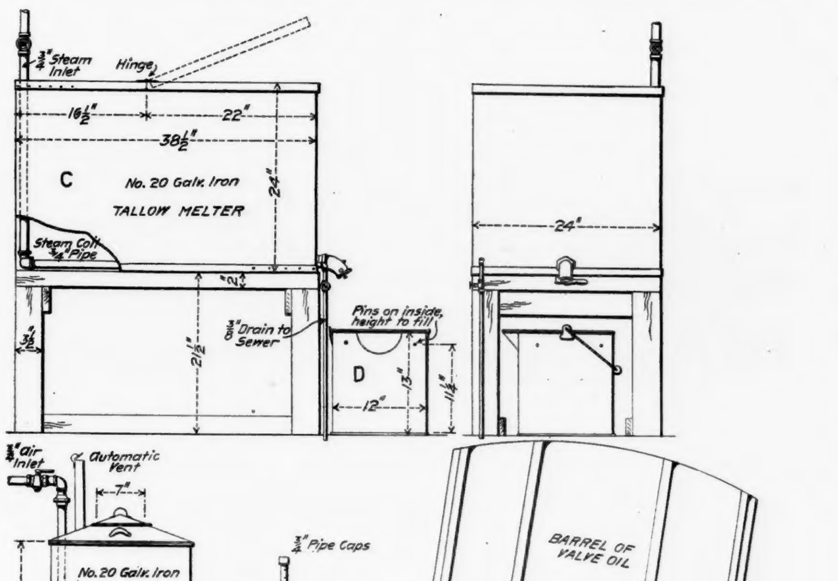
made. An iron tank, "C," holds two barrels of tallow. This tank has a steam coil in the bottom, by means of which the tallow is brought to 120 deg. F., after which the tallow is run in liquid form into a bucket, "D," which is gaged to the formula requirements. Valve oil is then drawn from barrels and the tallow and valve oil are each placed in tapered cans, "E," of 168 lbs. capacity. After thoroughly stirring the tallow and oil together, the caustic soda is added and thoroughly stirred for a short time, after which the grease is allowed to stand for 48 hours. These cans are tapered so that by turning them over the rod grease will readily leave the can. After the grease has stood for 48 hours, it is placed in the rod grease press and pressed into stick form of two sizes, to fit the different kinds of cups on engines. The sticks are cut off 9 in. long, and when the grease is put in cups it can be cut to any length. The contents of one of the large cans, or 168 lbs., is placed in the press, the grease end of the machine revolving on a pivot. The press is then turned around in a direct line with the air piston and the pressure is applied. From 100 to 130 lbs. air pressure is required to operate the press. One end of the grease cylinder is conical, with a detachable nozzle. The conical portion of the cylinder is encircled with a steam coil, so that the grease will flow smoothly through the nozzle and come out in compact stick form.

The capacity of this plant is about 2,640 lbs. in 10 hours. One man operates the machine and cuts the sticks, and another places the sticks on shelves, where they lay for five days before packing into boxes for shipment. The air pump in connection with the press is used when the air pressure falls below that required to run the press. This rod-cup grease is made and pressed under the supervision of the foreman of the paint shop, and this work is done with practically no extra cost to the company, because the work is done when the paint force is not busy.

We are indebted to F. G. Benjamin, Master Mechanic, for the above description.




Compressor Cylinders—Chicago & North Western Grease Plant.




Accessories at the Grease Plant of the Chicago & North Western.

## Some Old High-Speed Engines.

BY HERBERT T. WALKER.

The locomotive engine is an offshoot of the stationary engine, for while it is a goodly branch, exceeding in historical interest, perfection of development, and far-reaching influence that of the parent tree, the reader hardly needs to be told that the designs of Trevithick, Hedley and Stephenson were evolved long after James Watt had perfected his steam engine. As it takes time to overcome the inertia of established ideas, we find that when the locomotive men came into the field, they were naturally influenced by stationary engine traditions and practice, even against their imperfect knowledge of the changed conditions under which their engines would have to work; for Watt's beam engine of low pressure and slow speed used chiefly for pumping water, was the only practical steam engine up to that time, and it was not to be expected that the early locomotive designers could strike out on original lines.

We thus see how it was that the primitive locomotives were distinctly of the fixed engine type; upright cylinders and working beams, with a low piston speed being (with the exception of Trevithick's designs) the general arrangement. These ideas were even applied to the track, for the rails were laid on stone sleepers after the manner of stationary engine foundations. With the exception of Trevithick, with his direct-acting, high-speed, high-pressure "puffers," it is interesting to note the small progress made by his successors, and how much the influence of the coal mine practice impressed itself on their locomotives; for, like Trevithick, both Hedley and Stephenson were brought up within sound of the slow, mournful throb and wheeze of the deep mine pumping engines.

Another hindrance to the introduction of the high-speed non-condensing engine was the personal influence of Watt himself; for, although he described a steam carriage in his patent specification of 1784, he took no steps to develop it, the origin of his want of interest in this form of the steam engine being, doubtless, his rooted prejudice against high pressure steam and high piston speed, for the miserable boilers of his time were useless for pressures over 5 or 6 lbs. per in. Although he proposed, as far back as 1765-66, a direct-acting pumping engine, he preferred to develop the engine with a ponderous working beam which, for obvious reasons, was dangerous to run at anything like high speed. When Trevithick introduced his cylindrical boilers and pressures of 150 lbs. per sq. in., Watt went so far as to say that the Cornish mine "captain" deserved hanging for bringing into use the high pressure engine. The great Scotch engineer, however, suffered from dyspepsia and intense headaches, and sometimes said things he was sorry for afterwards; and, while we would not for a moment cast a shadow of

depreciation on the illustrious name of Watt —for, as a French engineer with characteristic enthusiasm said, "The part which he played in the mechanical application of the force of steam can only be compared to that of Newton in astronomy and of Shakespeare in poetry,"* still we incline to agree with Zerah Colburn, who declared that "No man did more to retard the introduction of the locomotive engine than James Watt."

Soon after the advent of Stephenson's "Rocket," it began to be recognized that trains would have to travel faster than 30 miles an hour, for, as Brunel put it, "Speed within reasonable limits is a material ingredient in perfection in traveling;" but engineers appeared to think that the only way to increase the speed capacity of the locomotive was to enlarge the diameter of the driving wheels, since it had long been laid down as a principle that the piston speed of locomotives should be kept as near as possible to the usual rate of Watt's engines, namely, 220 ft. per minute. Even Brunel with his great mind and far-seeing eye could not detach himself from this fixed idea, for when ordering the express engines for the Great Western he set a limit on the piston speed, which was one reason why the builders provided such large driving wheels that some of the engines were, for all practical purposes, useless.

*E. M. Bataille "Traité des machines à Vapeur." Paris, 1847-49.

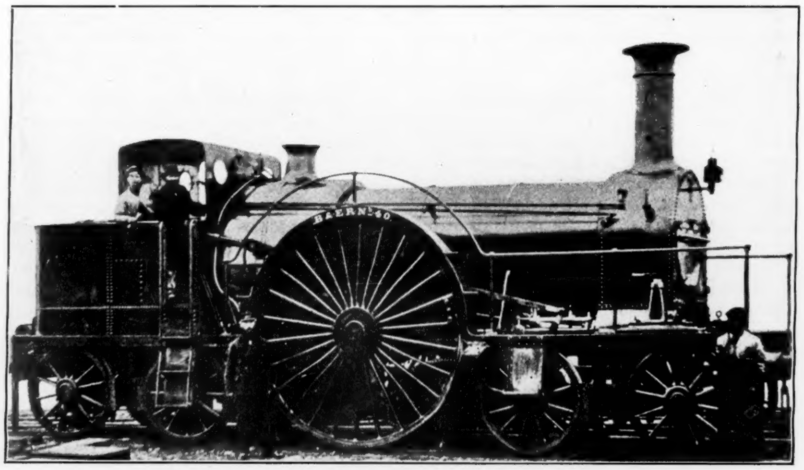


Fig. 3—Pearson's Engine, "No. 40," as Rebuilt in 1868-70.

With the foregoing remarks in mind, we will examine some English express engines which, for certain reasons, are of historical interest.

In the year 1847, James Pearson, locomotive superintendent of the Bristol & Exeter Ry. patented (British patent No. 11,885) a design of locomotive engine, which had a leading four-wheel truck, any desired number of driving wheels, and a four-wheel trailing truck; but about five years elapsed before he practically developed his ideas. The Bristol & Exeter had a track gage of 7 ft., as it joined the Great Western at Bristol, and was opened as far as Bridgwater in 1841; but it was not until 1844 that the line was completed to Exeter. It was on a portion of this railroad that Daniel Gooch made his celebrated series of experiments on train resistance in 1847.

Pearson was of a reserved disposition and kept interviewers at a distance, for which reason some inaccurate statements regarding his engines were circulated, his indifference to public opinion being such that he seldom took the trouble to reply to his critics or correct their errors. He was formerly engaged on the South Devon Ry (which was originally worked on Samuda's Atmospheric System) and was, doubtless, associated more or less with Brunel and Gooch, for his engine designs show the earmarks of the Great Western practice. Before the year 1853 his ideal express engine had taken tangible shape, and Rothwell & Co., of Bolton-le-Moors, received orders to build eight engines to his design for the Bristol & Exeter. Three of them (Nos. 39 to 41) were delivered in 1853, and the remaining five (Nos. 42 to 46) were completed in the following year. They were 10-wheel tank engines and

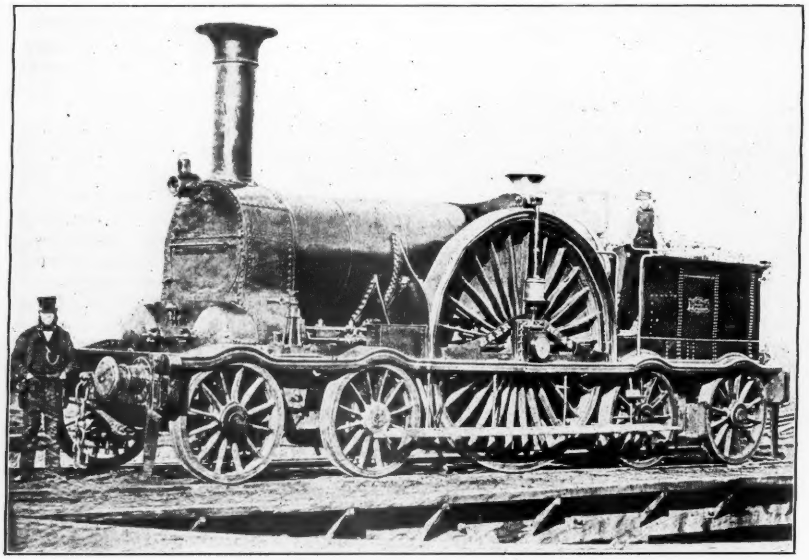


Fig. 2—Pearson's Engine, "No. 44," Bristol & Exeter, 1854.

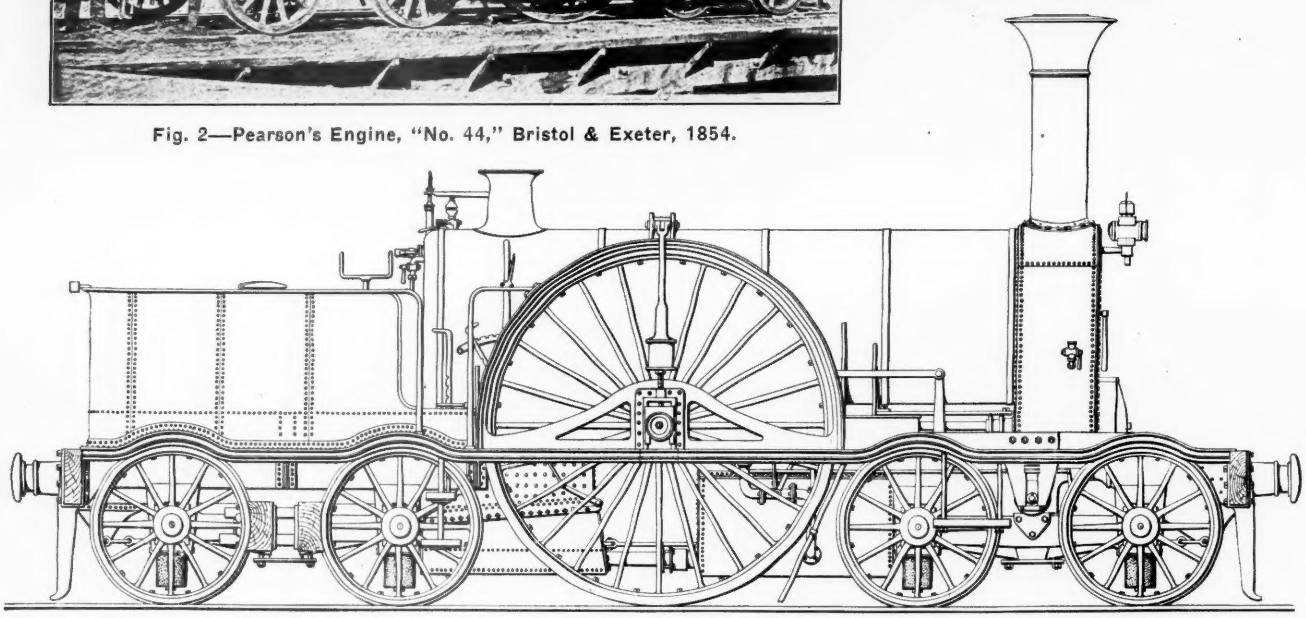


Fig. 1—Pearson's 4-2-4 Engine, "No. 40," Bristol & Exeter, 1853.

were all practically duplicates, a side elevation of No. 40 being shown in Fig. 1. The principal dimensions were: Cylinders, 16½ in. x 24 in.; driving wheels, 9 ft. diameter with treads (no flanges) 6 in. wide; truck wheels, 4 ft. diameter; boiler, 4 ft. 0½ in. diameter x 10 ft. 9 in. long; heating surface of tubes, 1,067.2 sq. ft. (the fire-box heating surface is not given, but the total heating surface did not probably exceed 1,150 sq. ft.); boiler pressure, 130 lbs. per sq. in.; weight in working order, 94,080 lbs. The adhesive weight is not known, but it was probably about one-third of the total weight, say, 31,360 lbs. From the above data, the tractive effort would be about 6,685 lbs. and the piston speed at 60 miles an hour would be 747.08 ft. per minute.

At the period under notice, engines with 7-ft. driving wheels were common on the standard gage, and some of Crampton's engines had 8-ft. driving wheels. On the 7-ft. gage 8 ft. was the usual diameter for express engines. In 1838 engines with 10 ft. driving wheels were tried on the Great Western but never went beyond the experimental stage. In 1855 a four-coupled engine was built for the Western of France, having driving wheels of 9 ft. 4 in. diameter, but it was not a success. A side elevation of this engine will be found in Colburn's "Locomotive Engineering and Mechanism of Railways," and a photographic reproduction of the engine itself was published in the "Locomotive Magazine" (London), Vol. VI., page 204. When Gooch's engine "Great Western," with 8-ft. driving wheels attained a speed of 78 miles an hour in the year 1846,* Francis Trevithick, a son of Richard Trevithick, and division master mechanic of the London & North-Western, could not be satisfied until he had built a standard-gage engine, with larger driving wheels and higher speed capacity than any engine on the broad gage. His ideas were embodied in the engine "Cornwall" of 1847,† which had 8 ft. 6 in. driving wheels and attained a speed of 79 miles an hour, thus beating the "Great Western" by one mile an hour. Pearson, who was a broad gage champion, felt in duty bound to maintain the supremacy of the 7-ft. gage locomotives, and this was one reason why his engines under notice had driving wheels 9 ft. in diameter, being 6 in. greater than those of the "Cornwall." They were the largest ever practically used, and the speeds attained reached to within a fraction of 81 miles an hour, the highest speed recorded up to that time and for many years afterwards.

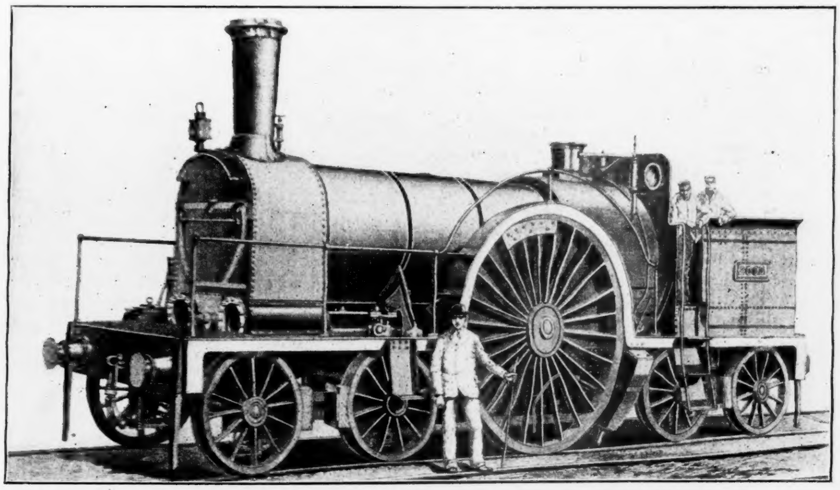


Fig. 4—Pearson's Engine, "No. 2002," as Overhauled by the Great Western, 1876.

Some of the details of these engines are of interest. The main frames and driving boxes were inside, but there was an angle-iron extension, which formed the running board, and this supported a kind of bracket frame outside the driving wheel, and to this was fitted an axle box, so that each driving wheel had two journal boxes, one outside and the other inside the wheel. These journal boxes were connected by rods and springs to the two ends of a short equalizer which was pivoted to a heavy beam bolted transversely to the top of the boiler. The outside spring was a block or disk of india-rubber, enclosed in a polished brass casing, and that on the inside was a steel volute spring. Of course, only one end of the beam and one end of one of the equalizers appear in the drawing, but from a photograph of engine No. 44, reproduced in Fig. 2, the arrangement can be seen better. The bracket frame also supported the wheel guard and a large semi-circular disk plate, so that the main driving box with its steel volute spring and the boiler could not be seen behind the driving wheel. The truck wheels had india-rubber springs, which can be seen below the journal boxes (Fig. 1); but it was not long before they were removed and double elliptical plate springs substituted. From the drawing it would appear that the carrying wheels are rigid, but the bolsters are obscured by the main frame.

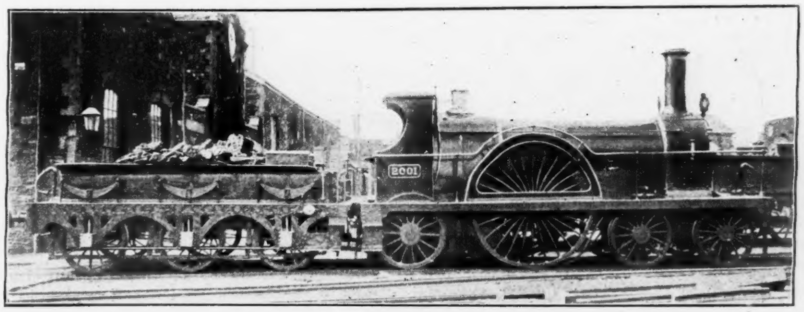


Fig. 5—Pearson's Engine, "No. 2001," as Rebuilt (with Tender), 1876.

There were three water tanks, one suspended to the frames below the boiler barrel, the next formed the floor of the ash pan, and the third was in the coal bunker. They were connected together by leveling pipes, one of which, with its expansion joint, appears in the drawing. The pumps were worked from the cross-heads, the suction being connected to the forward tank, the delivery checks entering the boiler behind the driving-wheel disk plates. As the engine was inside connected, it might appear from the drawing that the cranks would strike the boiler, but it must be remembered that this was a 7-ft. gage engine and there was ample room for the cranks to work between the boiler and driving wheels.

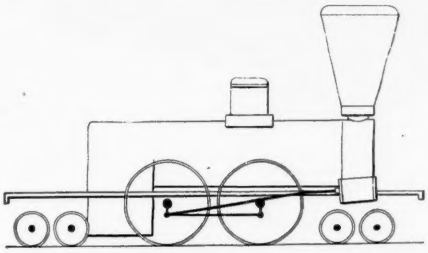


*Fig. 6.*

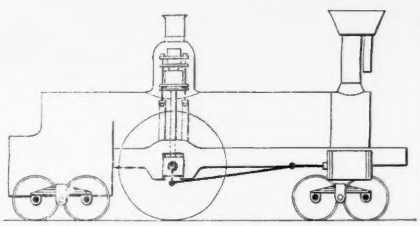


*Fig. 7.*

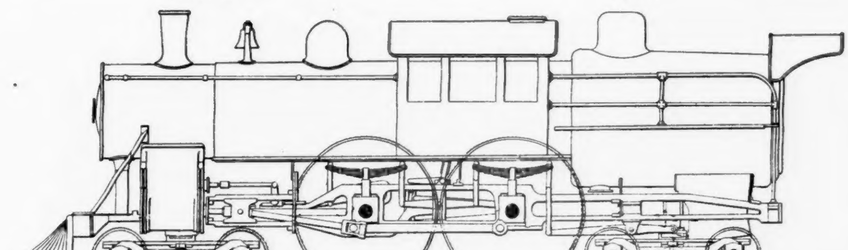


*Fig. 8.*

Engines with Leading and Trailing Trucks.

*See "Railroad Gazette," Vol. XXXV., page 736.
†See "Railroad Gazette," Vol. XXVI., page 208.

All published accounts of these engines agree in stating that they attained speeds at a rate of between 80 and 81 miles an hour, and Pearson himself affirmed that these speeds were made during official tests; also that for a mileage of 100,000 miles the average consumption of fuel (coke) was only 21¾ lbs. per train-mile. This record appears good, for we find that the grades of the Bristol & Exeter are by no means easy. The total length of the road is about 75 miles. Leaving Bristol there is a climb for five miles at the rate of 12 ft. to the mile and, after running down on the other side of the summit, there follow 35 miles of practicaly level grade to Taunton. Then comes the Wellington bank, the hardest 10 miles of the whole distance, grades of 30, 58⅔ and 66 ft. to the mile being encountered. From the summit to Exeter, a distance of 18 miles, the road falls about 300 ft. over undulating grades. The above figures are approximate only.

As no record of the weight of the trains hauled by these engines could be found, nor has any been published as far as the writer knows, he opened a correspondence with Mr. W. Babbage, Sr.; a veteran engine driver, who was born in 1835. Mr. Babbage saw hard service on the Bristol & Exeter, Great Western and Somerset & Dorset until 1898, and is now living in retirement in the county of Somerset. He joined the Bristol & Exeter road in 1853, and drove engine "No. 40." His account of these engines is somewhat disappointing, for he says that the recorded high speeds were made when running down grade and without a train. The average regular speed did not exceed 60 miles an hour on the level, but on the up-grades the engines wanted a lot of coaxing, and, with a greasy rail an assistant engine was required up the Wellington bank. The trains consisted of from four to six coaches, and, as these would not exceed 10 long tons apiece, the weight of the train was only about half as much more than that of the engine itself.

As the business of the railroad increased it was found that these engines could not keep time with the heavier trains, and in 1868-70 Pearson decided to rebuild some, if not all, of them. The cylinders were increased to 18 in. diameter, and the boiler and fire-box were enlarged, giving a total heating surface of 1,235 sq. ft. The bracket frames and journal boxes were removed, together with the transverse beam and equalizers, the driving wheels having inside bearings only. The ash pan tank was cut out and the leveling pipes continued back to the bunker tank. There were other minor changes and additions, and the engines, as rebuilt, weighed 111,428 lbs., of which 41,-440 lbs. rested on the driving wheels. The engines then did good work on a consumption of coal of about 25 lbs. per engine mile and a low average cost of repairs. A photograph of engine "No. 40" in its altered state is reproduced in Fig. 3.

In 1876 the Bristol & Exeter and the Great Western were amalgamated, and four of these engines (it is presumed the other four went to the scrap heap) were overhauled and kept for express work. They were renumbered 2001 to 2004 and No. 2002 is shown in Fig. 4. It appears that the Bristol & Exeter allowed their track to fall into bad order some time before the amalgamation, so that when the Great Western took charge of the road they found that extensive renewals would be necessary, for the rails were of the bridge pattern, weighing about 68 lbs. per yard, laid on longitudinal sills 14 in. x 7 in., with transome 11 ft. apart, and the roadbed was poor. But, before anything could be done, the up-express, known as the "Flying Dutchman," met with an accident on July 27, 1876, when going at full speed through the Bourton cutting near Long Ashton. The engine, No. 2004, left the rails and after plowing up the track for some distance turned over and was a complete wreck. The engine driver and fireman were killed and many of the passengers seriously injured. This accident was attributed, by those who ought to have known better, to the large wheels and high center of gravity of the engine, but when the usual Government investigation was made, Captain Tyler reported that where the derailment occurred no less than six rail fastenings were loose, and the general condition of the track left no doubt as to the cause of the disaster.

Soon after the above events the three remaining engines were again rebuilt with 8-ft. driving wheels and a pair of trailing wheels in place of the rear trucks. The coal bunkers were cut off and 6-wheel tenders were added. Fig. 5 shows engine No. 2001 in this the final stage of Pearson's notable tank engines. They did good service until 1892, when the 7-ft. gage was abolished.

These engines were the culmination of the large driving wheel theory in England, and, although American engineers did not keep clear of this fallacy, wheels of excessive height were short lived in the United States, and our designers were among the first, if not the first, to introduce fast engines with small driving wheels and high tractive effort, recognizing the desirability of large steam ports with a quick acting valve and a free exhaust.

Nearly all the interesting features of Pearson's engines are now obsolete and will never be revived; there is, however, one part of the design that might be worth repeating, namely, the forward and rear trucks; for engineers who have traveled on these locomotives agree in saying that they were really delightful to ride on, being remarkably steady even at the highest speeds, and, in fact, the enginemen used to say that the faster they went the easier they seemed to ride. They rounded curves with ease and were light on the track as the weight distribution gave about four tons to each wheel. American practice is not without examples of this wheel arrangement, for in Clark & Colburn's "Recent Practice in the Locomotive Engine," 1860, an outline of a double-truck engine built in 1847 at Springfield, Mass., is given and a copy is presented in Fig. 6, while Fig. 7 represents an engine built by Ross Winans in 1849 (some authorities say 1843). This was the "Carroll of Carrollton" and was operated on the Boston & Worcester Railroad. It had 7 ft. driving wheels, and steam cylinders were mounted on the dome, the pistons being made to press down upon the driving boxes, so that the adhesion might be varied between three tons and 12 tons when necessary.

Of late years locomotives with a pair of trailing wheels have come into use, and for express work the Atlantic or 4-4-2 type of engine has been found satisfactory; but in some cases with a heavy fire-box the single pair of trailing wheels carries more weight than the leading truck, so that on entering a curve the front end of the engine, carried on the four-wheeled truck, readily conforms to the new direction, but the heavy sluggish rear end on a single pair of wheels does so in a lesser degree, and, consequently, at high speeds some severe lateral and vertical movements take place, and the disturbing effect on the track is great, even to the bending of the rails. Enginemen have also complained of the rough riding of some of these engines.

It thus appears that with the ever increasing size of fire-box, a better wheel distribution than that afforded by a single trailing axle would be desirable, and Mr. S. M. Vauclain has recently patented a design of engine with this object in view, an outline being shown in Fig. 8. As all the wheels back of the forward truck are equalized it should make an easy riding engine, and it is probable that a locomotive of the 4-4-4 type will be with us at no distant date. As is well known, a German engine with this wheel arrangement has been built and tested on the Berlin-Zossen high speed line.

The half-tone illustrations accompanying this article have been reproduced from photographs by the courtesy of the Locomotive Publishing Company, London.

## Baldwin Electric Trucks.

The conditions which must be met in electric street or interurban railroad operation are in many ways much more severe than those existing on steam roads, and the mechanical problems involved in designing a satisfactory truck for such service are complicated and difficult. As a rule the track is not up to the standard of steam railroads, while the speeds are nearly if not quite as high. The car bodies are lighter, and to prevent excessive vibration and rocking, a sensitive, equalized spring arrangement is necessary. To round the sharp curves on city streets, a short wheel base must be used, and every member of the truck frame must be strong and rigid enough to resist the stress imposed by applying the motive power directly on the axle. The dead load of the motor suspended on the truck with-

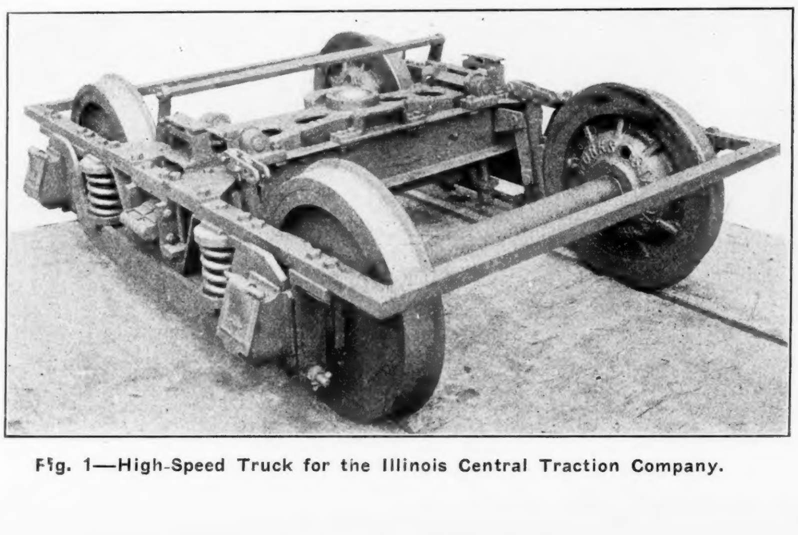


Fig. 1—High-Speed Truck for the Illinois Central Traction Company.

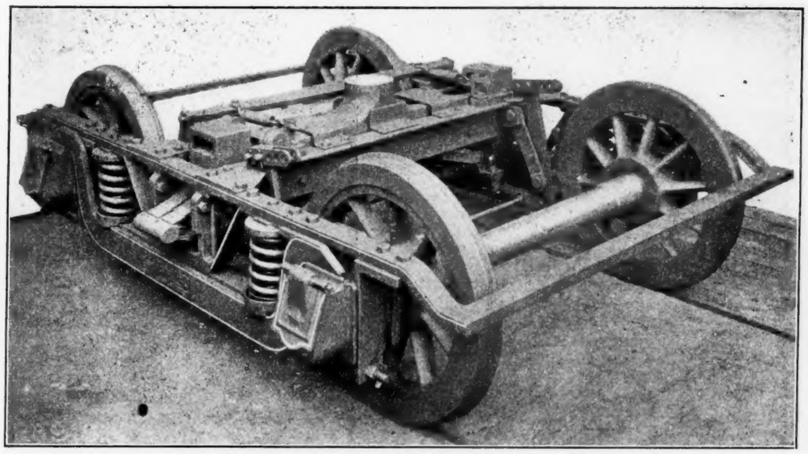


Fig. 2—Truck for the Twin City Rapid Transit Company.

out the interposition of springs to absorb the shocks produced at high speed, imposes another condition to be met. Added to these is the difficult problem of providing space for two motors of as much as 200 h. p. each, within the limits imposed by a gage of 4 ft. 8½ in., and a wheel base rarely exceeding 6 ft. 8 in. The earlier forms of electric trucks were adapted from the running gear used under horse cars, but nearly all of the recent designs of high-speed trucks are patterned after steam railroad four-wheel passenger trucks in the arrangement of springs and equalizers, although some few have adopted pedestal springs without equalizer bars. In the *Railroad Gazette*, June 19, 1903, p. 432, a number of types of electric trucks were illustrated and described, which represented the latest developments in this branch of car building. Among them were two designs of the Baldwin Locomotive Works. Since that time this company has designed and built four new types of trucks which differ in many of the details of construction from those shown last year.

The truck shown in Fig. 1 was built for the Illinois Central Traction Company, to be mounted under a high-speed interurban car. It is designed to carry 26,250 lbs. on the center plate, and weighs, without motors, 11,000 lbs. Two General Electric, 73 C motors are mounted on it. The spring suspension is the usual arrangement with a double elliptic spring 30-in. long under each end of the bolster, and double coil equalizer springs 7¼ in. in diameter. The truck frame is wrought iron throughout, the top member of the side frames and the end frame being a one-piece forging of 2 in. x 3 in. bar iron. This insures that the side frames will remain parallel at all times. The transoms are 10-in. channels, and are rigidly fastened to the side frames by gusset plates over the top, and by cutting away the top flange, running the web through the arch-bar side frame, and bolting it to the columns. The pedestal jaws are wrought iron, bolted to the top bar of the side frame. The chief difference between this truck and a standard passenger car truck for a steam road is the absence of any cross bracing under the transoms between the tie-bars, and the substitution of a 3-in. x 1-in. wrought iron bar for the usual channel or timber spring planks under the bolster. The bolster springs rest on wrought iron bars supported by the hangers, which are carried up inside the transoms, and these are tied together by the light bar used for a spring plank. A cast steel bolster is used and double equalizer bars. The wheels are 33-in. steel tired, and the axles are 5½-in. in diameter in the center, with journals 4¼ in. x 8 in.

The truck built for the Twin City Rapid Transit Co., and shown in Fig. 2, is a much lighter truck than Fig. 1, although of the same general design. It weighs 6,300 lbs., and is designed to carry only 18,000 lbs. on the center plate. Instead of the 10-in. channel transoms, 3½ in. x 7 in. angle iron has been used, and correspondingly lighter construction has been used throughout.

In Fig. 3 is shown a light truck for street railroad service, which has a peculiar spring arrangement and equalizing system. The equalizer springs are in this case placed outside the boxes and the equalizer bars pass under the boxes, being hung from yokes which pass up over the top of the boxes in front and back of the pedestal. The wheel base of this truck is only 4 ft., which necessitated some such arrangement in order to retain the advantage of a long equalized spring base, which prevents any serious tilting of the truck when the brakes are applied. The top member of the side frame is a shallow diamond arch-bar, to which the 6-in. channel transoms are rigidly

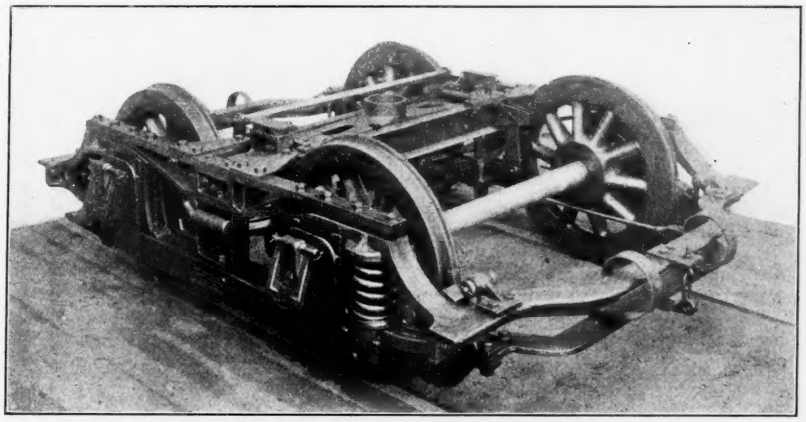


Fig. 3—Truck for Street Railroad Service.

connected with gusset plates and by bolts through the column and the web of the channel. Cast steel pedestals of a peculiar form are used. The top forms a bearing for the side frame, and is extended out beyond the jaws, and dropped down at the end, forming with a leg cast on the lower end of the jaw, a triangular space in which the equalizer springs are set. The spring caps are cast on the pedestals, and the 3¾-in. x 3¾-in. angles which form the end pieces of the frame are bolted on the projecting ends. This truck weighs 5,300 lbs., and is designed for a load on the center plate of 14,000 lbs. The brakes are outside hung on account of the short wheel base.

The trucks for the new cars of the Interborough Rapid Transit Company, of New York, operating the subway system, are, perhaps, the heaviest and most powerful that have ever been built for electric traction. One of them is shown in Fig. 4. It is designed to carry 25,000 lbs. on the center plate, and weighs, without motors and gear case, 12,500 lbs. Two Westinghouse motors, No. 86 B, are mounted, one on each axle. These motors, which were described in the *Railroad Gazette*, April 3, 1903, are 200 h. p. each, and can exert a tractive effort at the circumference of a 33-in. wheel of 4,150 lbs. at a speed of 19 m. p. h. The motor equip-

Fig. 4—Truck for the Interborough Rapid Transit Company, New York.

ment complete for one truck weighs about 5,500 lbs. The design of this truck is very similar to the one shown in Fig. 1, with the exception of the pedestals and the use of a separate 5-in. channel for the end frame. The same form of trussed side frame with a heavy 2½-in. x 4-in. top bar is used, but the connection at the transom is stiffened by the triangular filling pieces inserted. The pedestals are wrought iron, securely bolted to the side frame, and the outside jaw is bent around, as shown in the engraving, to form a bearing for the end frame, which is bolted to it.

All of these trucks are machine fitted, and all of the connections between members of the frame are bolted. This construction insures a rigid truck throughout, and one which can be easily dismantled or erected. The same shop methods to secure interchangeability and accurate finish are used as are used in building locomotives. Wherever possible the number of parts has been reduced by combining in one forging or casting several members of the frame, and the result is a stiff, easy-riding and noiseless truck.

## Bridges on the Pittsburg Extension of the Wabash.

The accompanying illustrations show the two largest bridges on the new line of the Wabash in Pittsburg. One is across the Monongahela at Pittsburg and the other is across the Ohio at Mingo, Ohio. Both have been completed within the last two months. The Monongahela bridge is the longest span cantilever bridge in the United States, the main channel span being 828 ft. It is double tracked and will carry all the Wabash trains in and out of the city of Pittsburg. The bridge over the Ohio has a shorter main channel span, but, including the approaches, it is longer than the Monongahela bridge. The main span is 650 ft. long and 90 ft. above low water. Messrs. Boller & Hodge, New York, were the engineers for both bridges and the American Bridge Company was the contractor.

## Comparative Railroad Statistics for 1901.

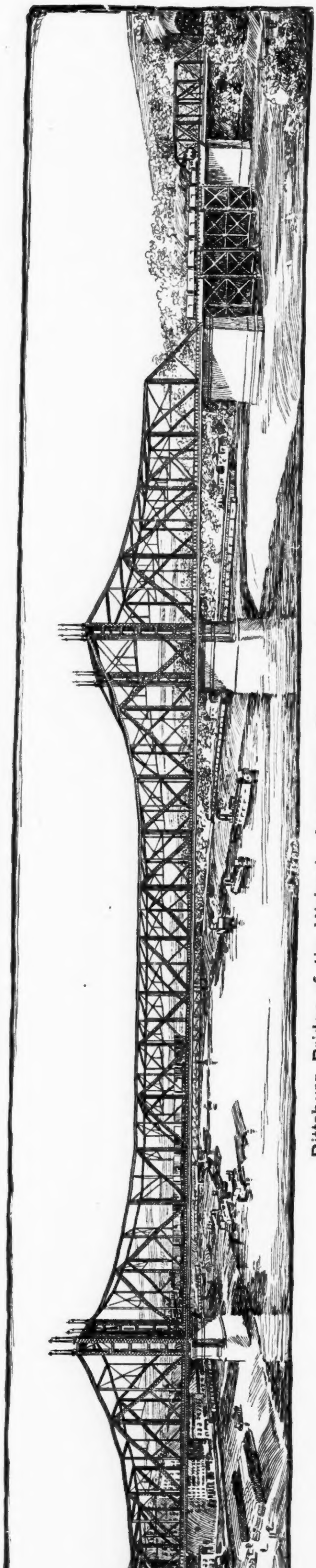
The *Journal of the German Railway Officials' Association* for May 7, 1904, contains a careful compilation of figures covering the railroads of the leading countries, and their operations during 1901. In the following tables, based on the above, to which the proper figures for the railroads of the United States have been added, the Prussian railroads are those owned by the government, and include those of Hessia, recently acquired; the railroads of Holland include only those owned by the government; the same of those of Belgium; the French railroads include only the main lines. The other headings explain themselves.

The relative density of railroads in various countries is indicated by the number of miles of railroad to each 100 square miles of area. The figures are as follows:

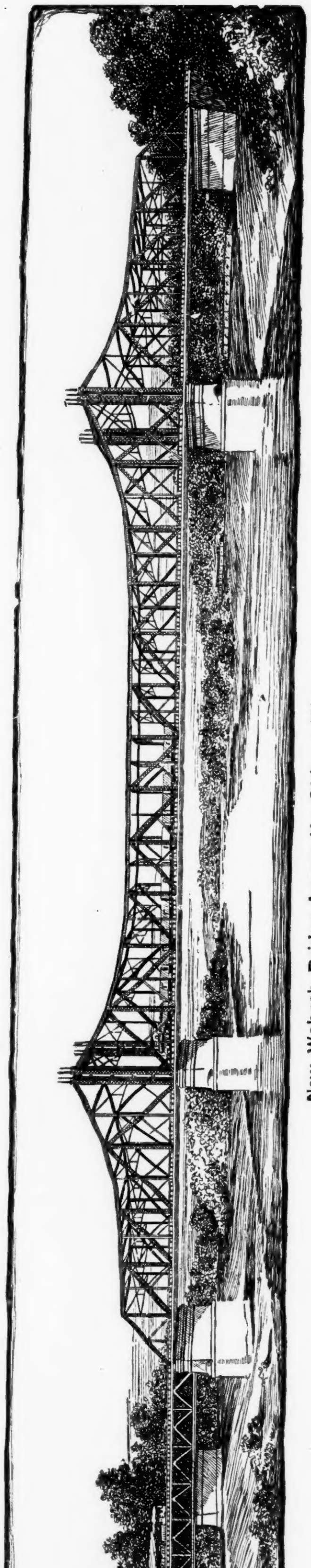
| | | | |
|---|---|---|---|
| Belgium | 22. | Switzerland | 9.4 |
| Saxony | 19.2 | Holland and Luxemburg | 9.1 |
| Baden | 14.5 | Bavaria | 9.01 |
| Alsace-Lorraine | 12.8 | France | 8.8 |
| United Kingdom | 11.3 | United States | 6.64 |
| Germany | 10.85 | Austria-Hungary | 5.2 |
| Prussia | 10.49 | | |

This great disparity in the relative density of railroads looks differently when the railroad mileage is proportioned to the number of inhabitants. The next table gives the railroad mileage per 10,000 inhabitants.

| | | | |
|---|---|---|---|
| United States | 25.52 | Belgium | 6.03 |
| France | 7.46 | Würtemberg | 5.04 |
| Switzerland | 7.33 | United Kingdom | 5.28 |
| Baden | 7.24 | Austria-Hungary | 4.66 |
| Prussia | 6.54 | Holland and Luxemburg | 3.79 |
| Germany | 6.4 | | |



Pittsburg Bridge of the Wabash, Across the Monongahela.



New Wabash Bridge Across the Ohio at Mingo.

These two tables indicate clearly the striking characteristic of our American railroads as compared with those of the old world, their enormous extent compared with our population, and their small mileage compared with our area. Closely connected with this comparison is that of the passenger and freight traffic on either side of the Atlantic. In relative extent the former falls far behind the European figures. The following figures indicate the number of passenger-miles per mile of track:

| | | | |
|---|---|---|---|
| Belgium | 678,396 | France | 340,371 |
| Prussia | 474,339 | Switzerland | 318,398 |
| Saxony | 462,090 | Austria-Hungary | 230,773 |
| Germany | 413,820 | United States | 89,721 |
| Holland | 351,803 | | |

The relatively higher development of European passenger traffic is also reflected in the revenue of the railroads from that source.

| | Passenger-Revenue-Mile. | Per Cent. of Total Revenue. |
|---|---|---|
| United Kingdom | $10,050 | 43.76 |
| Baden | 5,660 | 31.14 |
| Belgium | 5,360 | 34.07 |
| Switzerland | 5,090 | 45.87 |
| France | 5,085 | 43.56 |
| Prussia | 4,840 | 28.32 |
| Holland | 4,416 | 24.04 |
| Germany | 4,403 | 28.91 |
| Bavaria | 3,375 | 30.11 |
| United States | 2,219 | 22.12 |
| Austria-Hungary | 2,184 | 24.04 |

Moreover, the heavy European passenger travel, and the traffic conditions, have made low rates possible as compared with ours. In passenger revenue per mile our railroads stand near the foot of the list; in revenue per passenger-mile they stand first.

| | Revenue in Cents Per Passenger-Mile. |
|---|---|
| United States | 2.013 |
| France | 1.53 |
| Switzerland | 1.48 |
| Bavaria | 1.21 |
| Holland | 1.19 |
| Baden | 1.16 |
| Germany | 1.024 |
| Prussia | 0.986 |
| Austria-Hungary | 0.909 |
| Belgium | 0.767 |

In one other particular passenger traffic in the United States represents a striking difference from that abroad. The typical passenger rides a longer distance than in other countries.

| | Length of Average Passenger Trip, Miles. |
|---|---|
| United States | 28.58 |
| Austria-Hungary | 21.4 |
| France | 19.3 |
| Bavaria | 18.6 |
| Holland | 18.3 |
| Prussia | 15.5 |
| Germany | 14.6 |
| Belgium | 13.8 |
| Switzerland | 12.6 |

As regards freight traffic, on the other hand, the figures present quite a different picture. First, in the matter of density of freight traffic, the railroads of this country stand among the first.

| | Ton-Miles per Mile of Track. |
|---|---|
| Alsace-Lorraine | 905,067 |
| Prussia | 773,586 |
| United States | 760,414 |
| Germany | 651,590 |
| Baden | 624,647 |
| Saxony | 526,955 |
| Bavaria | 446,336 |
| Austria-Hungary | 441,721 |
| France | 425,873 |
| Holland | 371,500 |

The statistics of freight revenue do not show such a divergence as exists in that of passenger traffic, though the American railroads are near the bottom of the list. It is noticeable, moreover, that the proportion of freight revenue to total revenue is largest in their case, barring only Austria-Hungary.

| | Freight Revenue per Mile. | Per Cent. of Total Revenue |
|---|---|---|
| United Kingdom | $11,440 | 49.71 |
| Prussia | 10,930 | 65.32 |
| Belgium | 10,010 | 64.22 |
| Baden | 10,080 | 57.05 |
| Germany | 9,480 | 63.34 |
| Saxony | 9,350 | 56.27 |
| Bavaria | 6,670 | 60.21 |
| Austria-Hungary | 6,410 | 71.3 |
| France | 6,374 | 54.58 |
| United States | 5,804 | 70.4 |
| Switzerland | 5,452 | 48.85 |
| Holland | 4,680 | 45.39 |

The next table indicates the well known and striking difference in the character of railroad freight traffic in this and other countries, as regards length of haul.

| | Average Haul of Freight, Miles |
|---|---|
| United States | 251.98 |
| Bavaria | 87.9 |
| France | 81.3 |
| Prussia | 70.8 |
| Austria-Hungary | 64.6 |
| Germany | 62.4 |
| Holland | 56.1 |
| Baden | 48. |
| Switzerland | 34.6 |

The extension of American long distance freight traffic has gone hand in hand with a policy of low freight rates. As regards the average receipts per ton-mile the American railroads stand far below all others, as the following figures show:

| | Revenue in Cents per Ton-Mile. |
|---|---|
| Switzerland | 2.68 |
| France | 1.5 |
| Bavaria | 1.46 |
| Austria-Hungary | 1.44 |
| Germany | 1.41 |
| Prussia | 1.33 |
| Baden | 1.25 |
| Holland | 1.19 |
| United States | 0.75 |

These figures are, of course, averages, and are valuable only to that extend. They do, however, suggest the leading differences between American railroad traffic and policy at home and abroad.

## A Vestibuled Stock Car.

The accompanying illustration shows a vestibule attachment for stock cars which has been devised by Mr. William A. Buckner, of Cleburne, Texas. It is simple and inexpensive, and by its use the operation of loading, unloading or transferring stock from car to car can be rapidly and conveniently accomplished without danger to the stock, and without shifting the cars. The end posts of the car, which are made heavier than usual, are separated far enough to allow the stock to pass through, one at a time, and from them are hinged a pair of end doors. A platform extending almost the width of the car, and wide enough to rest on the end sill or buffer blocks of the adjoining car, is hinged to the end sill, and when not in use is folded up against the end of the car. When it is desired to establish connection between adjoining cars, the two platforms are lowered, one resting on top of the other, and the end doors are thrown open at right angles to the ends of the cars, the relation of the parts being such that a telescoping vestibule is formed.

The drawings, which are merely sketches, do not show working details. In order that the inside doors of the vestibule will be held in their open position each of the doors is provided with a slot through which eyes on the inner doors project, to be engaged by hooks secured to the end of the car. Another scheme for accomplishing this same object is shown in Fig. 5, a metallic strip being attached horizontally to the inside of the door, and having its upper edge cut out in such a way as to form a groove next to the side of the door. A hook secured to the door, above this strip, is made to engage the groove on the adjoining door.

An advantage claimed for the vestibuled car is that it will expedite loading, particularly at one-chute pens. By setting the middle car of a train of stock cars opposite the chute, and opening the vestibule doors between all cars, the stock may be driven through the train and all cars filled with only one setting. The use of a switch engine and crew is thus avoided. Pick-up stock trains, which leave terminals light and pick up cars of stock along the line, would save much time in loading where there is more than one car at a station. Where there are 10 or 15 cars at a station the time thus saved would often amount to two or three hours. In case of a breakdown, or if for any reason it is necessary to transfer stock from one car to another, an empty vestibule car can be placed next to the loaded car, and the transfer quickly made without taking the car to a chute, or of building a temporary chute in case of a breakdown.

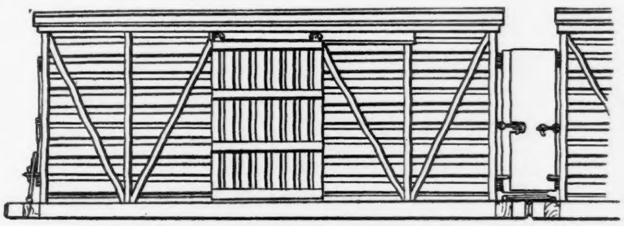


*Fig. 1.*

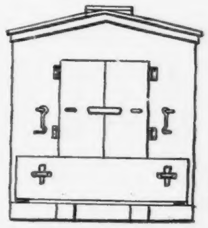


*Fig. 4.*

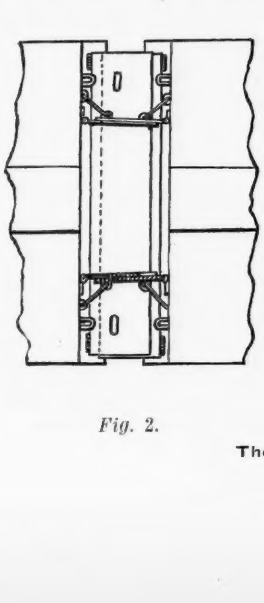


*Fig. 2.*

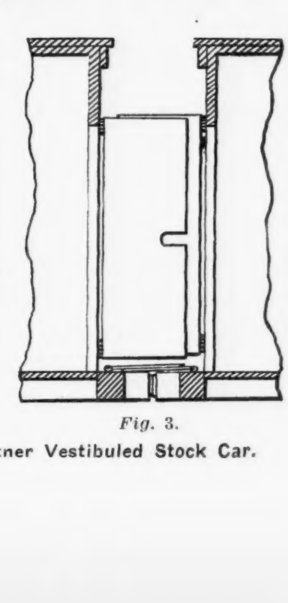


*Fig. 3.*

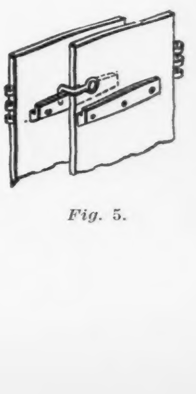
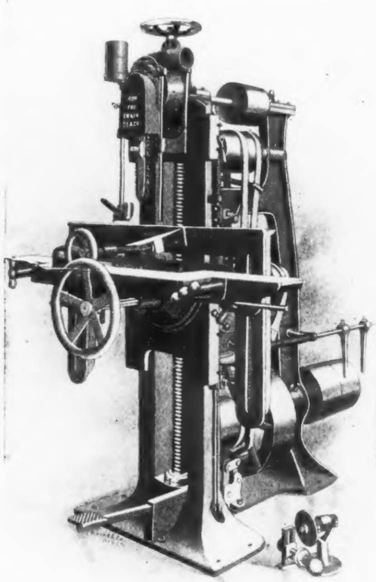


*Fig. 5.*

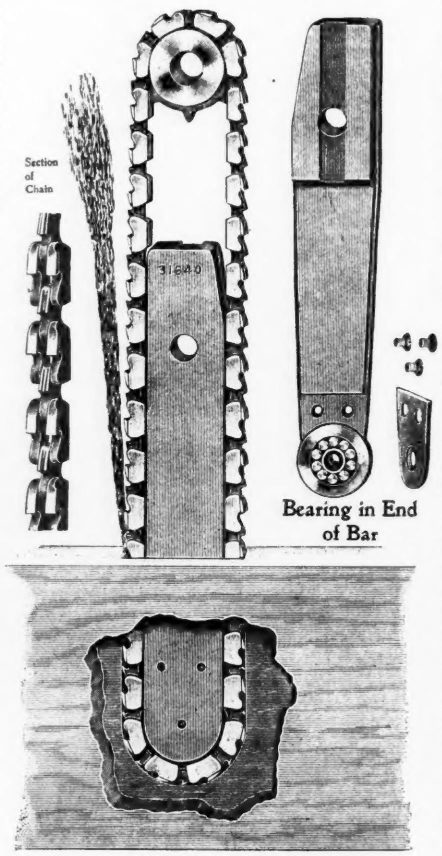
The Buckner Vestibuled Stock Car.

### A Chain Mortising Machine.

The accompanying illustration shows a chain saw mortise made by the New Britain Machine Company, New Britain, Conn. The mortise is cut by a steel chain, each link of which carries a cutter. These cutters have a cutting speed of about 1,500 f.p.m. The chain is driven by a sprocket wheel. A fan is mounted on the same shaft with the sprocket wheel and revolves with it, and sucks away the chips which are brought up by the cutters. The chain is guided by and runs over a bar which has a roller bearing at its end. The cutting takes place at the lower end. The work is clamped to the table, which is fed up by means of a foot lever. The machines have a capacity for cutting mortises from ¼ in. to 1 in. wide and from 1½ in. to 3½ in. deep when using light bars. By using a heavier bar a mortise 6½ in. deep can be cut. These machines are used by the Pennsylvania, the Canadian Pacific, New York Central, and other roads.



A Chain Mortising Machine.




Details of Chain Saw Mortiser.

### Standard Code on the Rock Island.

General Manager H. I. Miller of the Chicago, Rock Island & Pacific Railway Company, has issued a new edition of the rules and regulations for the operating department, and the books are now being distributed. From the order on the first page it appears, however, that the rules do not go into effect until the first of next August.

The rules are based on the latest edition of the Standard Code of the American Railway Association. Of general rules there are one more than in the Standard Code, the additional rule being one to require accidents and other unusual occurrences to be promptly reported by telegraph. The definitions under block signaling and interlocking follow immediately after the other definitions. Rule 2 is in the standard form, but the form of watch certificate does not appear in the book. Under rule 3, paragraphs *a*, *b* and *c* give directions about getting standard time when a standard clock cannot be reached, and require conductors and enginemen to compare time with each other, as of old. For rule 4 form B is used. Rule 6 prescribes D, N, DN, to indicate telegraph offices, but does not show abbreviations for leave and arrive. Rule 10 specifies *a* red, *b* white, *c* green. With rule 12 the pictures are given on the same page. Under rule 14, signal *e* is followed by two other whistle signals, for flagmen on branch or auxiliary lines. These are, from the west or south, four long and one short; from the east or north, five long and two short. The rest of the whistle signals, therefore, have letters different from those in the Standard Code, and after the station signal two others are added. The first (q), consisting of two short and three short sounds, is to call the attention of conductor and brakemen to a 19 train-order signal. (The order is, presumably, to be taken without stopping the train.) The next signal, one long and one short, is to warn a train on another track that it is too close to the train ahead of it.

Rule 18 has a supplementary paragraph requiring a white light on the top of the tender when an engine is backing at night. Rule 19 has supplementary paragraphs requiring additional markers on both passenger and freight trains, and indicators in cabooses. Rule 23, clause *a*, forbids taking off markers too soon. Rule 32, clause *a*, forbids sounding whistles near passenger trains.

Rule 83 (a) tells of train registers and their use; rule 88 (a) authorizes extra trains in the superior direction to hold the main track. Rule 90 (a) regulates the meeting of trains on sidings which are used in both directions. Rule 97 (a) reads: "Yard limits will be indicated by yard-limit boards. Within these limits yard engines may occupy main tracks, protecting themselves against overdue trains. Extra trains must protect themselves within yard limits." Rule 99 reads: "When a train stops or is delayed under circumstances in which it may be overtaken by another train, the flagman must go back immediately with stop signals to a point where he can have an unobstructed view of an approaching train for at least one mile, and as much further as is necessary to insure full protection. He must at once place one torpedo on the rail on the engineman's side, and will remain until recalled. When recalled he may return after placing a second torpedo on the rail 60 ft. from the first one. If an approaching train is in sight or if a passenger train is due within ten minutes he must remain until it has been stopped. The front of the train must be protected in the same way when necessary by the fireman."

Rule 104 (a) requires enginemen after having backed into a siding to see that the switch is properly set. Rule 106 is in full-face type.

Immediately following rule 106 are rules 151-153, requiring trains on double track to keep to the right; requiring protection by flag when crossing over; requiring caution where a train is receiving or discharging passengers at a station [not elsewhere] and requiring enginemen to watch for trains which are running too close together and call their attention to the fact.

Rule 207 (a) requires the initials of foreign locomotives to be used in train orders. Rule 210 (a) requires conductors to show train orders to flagmen, baggage men, brakemen and porters; and enginemen to show orders to the firemen and the head brakeman; and these subordinates are required to read and bear them in mind.

Rule 211 (a) forbids the use of "19" orders to restrict right or superiority. Rule 212 (a) defines the meaning of the signal X. Rule 216 (a) prescribes the method of delivery of orders to persons in charge of work requiring the use of track in yards. For rule 221, form A is used. The fixed signal is used to enforce the time interval between trains. Rule 223 has no abbreviation for the word complete, and does not contain S. D. (for stop displayed); the X response is not to be given until the train order signal has been displayed.

In the examples under the forms of train orders, towns along the line of the road are used instead of the Oriental names given in the Standard Code. Form D does not appear. Under form E there is a fourth example under which what is practically a schedule is made by saying that the train will wait at

Topeka until nine twenty, 9:20 p. m.,

Bishop until nine twenty-eight, 9:28 p. m.,

and so on for a half-dozen or more stations. One double-track form is given to provide for a movement against the current of traffic.

The rules for the telegraph block system adhere quite closely to the Standard Code. For rule 317 form B is used, and for permissive signaling a caution signal (not a caution card) is used. Rule 318 is given in both forms A and B. Rule 331 does not prescribe any time interval, and permission to proceed may be given either by a caution signal or a caution card. Under the head of interlocking, rules 611 to 636, inclusive (the instructions to signalmen), are not given; neither are those for repairmen (681-686). Following rule 669 are four rules describing the theory on which signals are designed and set up. Beginning with No. 701 rules, severely condensed, are given for trainmasters; for all of the classes of employees usually provided for in books of this kind, and also for levermen, chief despatchers, train despatchers, linemen, road foremen of equipment, master mechanics, engine house foremen, car inspectors, division engineers, the signal engineer and captains of police.

# GENERAL NEWS SECTION

### THE SCRAP HEAP.

Passenger train No. 5 of the Denver & Rio Grande was stopped by robbers on the night of June 7, near Parachute, Colo., and a bag of coin was taken from the express car. A brakeman was shot and wounded.

Adolph Ottinger, a ticket broker of San Francisco, has been imprisoned two days and fined $300 for violating an injunction of the United States Court forbidding him to deal in certain reduced-rate convention tickets.

The Pennsylvania is taking a party of its eastern city ticket agents to St. Louis, where they will spend several days at the Fair; and it is said that the company will give similar excursions to its agents at all of the larger stations.

It is reported at New Orleans that the railroads have agreed to settle the rate war which has made the rate on sugar from that city to Omaha and Kansas City abnormally low for many weeks past. Beginning July 1 the rate to Missouri River points will be 37 cents per 100 lbs.; to St. Paul and Minneapolis, 30 cents.

Shipments of anthracite coal from the mines in the month of May aggregated 5,285,079 tons, which is larger than in any month ever reported, except April of this year and January of last year. This heavy movement does not include the usual volume of shipments by lake, as lake navigation is largely suspended on account of the strike; and the demand is still very active.

The number of men employed in the shops of the Pennsylvania Railroad at Altoona on June 1 was about 9,500; two years ago it was 12,000. The pay rolls now aggregate $260,000 monthly; in 1902 the total was $575,000. The fact that the pay roll has been reduced 54.8 per cent. while the number of men has fallen off only 20.8 per cent. is explained by the fact that the men now work only eight hours a day and five days a week. This week a further reduction of time and additional dismissals were ordered.

The roads west of Chicago have agreed that after this year clergymen's reduced rate certificates shall be made good only to points where the fare is $20 or less. Clergymen wishing to make trips costing more can get special trip permits on application to the association having jurisdiction of the territory in which the trip is to be made. About 55,000 clergymen hold annual permits good on roads in all three of the western passenger associations. The permits are sold for $1 each and the proceeds are divided between the associations.

The Railroad Commission of Mississippi has adopted revised demurrage rules, in which there is a clause imposing a charge for "delayage" on a railroad which does not move freight with a specified degree of promptness. The rules, both demurrage and delayage, cover less-than-carload freight also, the rate on this class being 1 cent per 100 lbs. per day. The delayage rule requires freight to be moved at least 50 miles a day, beginning at 7 o'clock the next morning after it is received, and the penalty for non-compliance is the same as the demurrage rate, $1 per car per day. An extra day is allowed at transfer points, and allowance must be made for delays which the railroad company cannot prevent. Applications from shippers for cars must be filled within five days, the penalty for failure being $1 a day; but if a shipper fails to load a car, or to give proper shipping instructions, or does not properly load his goods, he shall be liable for $1 per day per car. After a car is loaded, the agent must promptly give a bill of lading for the goods. If a car in transit is side tracked, the penalty accrues. Twenty-four hours' free time is to be allowed for delivering cars to connecting lines. If at a junction point one road refuses or delays to switch cars for another, the penalty accrues.

### Collision on the St. Lawrence.

Near Sorel, Quebec, on Sunday morning last, the Richelieu & Ontario Navigation Company's steamer "Canada," bound from Quebec to Montreal, collided with a coal steamer and sank in 20 minutes. Five persons were killed, including the purser of the "Canada."

### Mexican Permanent Exposition Company.

To exhibit in the City of Mexico the products of other countries, the Mexican Permanent Exposition Company has been organized. Buildings now being put up for the exhibition will be ready about Oct. 1, 1904. The association has appointed E. H. Talbot, of New York, commissioner, with power to assign space and arrange all details relating to exhibits. For the present, Mr. Talbot is at the Manufacturers' Building, World's Fair, St. Louis.

### End of Lake Strike.

A press despatch from Cleveland on Tuesday last reported the end of the strike of captains and pilots on the lakes, the district Captain of the Masters' and Pilots' Association having announced that the Association gives up the contest. It was expected that the full fleet of the Lake Carriers' Association would be started within a few days. The strike has lasted six weeks and has caused the practically complete suspension of the most important freight traffic on the Lakes during that time; and has been the most costly strike among the vessel men for many years.

### A Rational Basis for Wages.*

When the wage earner sells time the employer does not necessarily obtain anything, not even as tangible an asset as a ton of very poor coal. Just as the coal operator has foisted tonnage on his client, so the foolish employing class has forced the wage earner to foist time on his employer, and the employer blind to the essentials of the transaction builds up an elaborate system of time checks and time keeping (both of which are merely incidentals and not essentials in good system) to the utter neglect of matters much more important. Some employers, realizing that time in itself had no value, have endeavored by means of piece work to buy *output*. When he sells his time, the wage earner does give something of value to himself, even if it may have none for his employer, but he can no more accurately and justly sell output than the coal operator can sell horse-power from a boiler and engine over which he has no control. It might on occasion be convenient temporarily to measure the merit of the wage earner by his output, just as it might be convenient to measure the value of a coal by the horsepower obtained from it in a given power-house, but the moment a new power-house is put up, the moment a wage earner is coupled up with better facilities, the purchaser falls back on the market price of coal and on the market price of skilled labor.

It is perfectly possible to find an equitable basis for reward. The wage earner, like the lawyer, has four different things to sell: (1) His time and liberty. (2) His skill, profession or trade. (3) His intelligent co-operation. (4) His power to do harm. A living daily wage is due to every man who signs away his liberty to another. The minimum wage is a matter of contract. It should be due the man whether he is present or absent as long as he remains on the pay roll. This is the wage payable as equivalent for assignment of time and loss of liberty. This part of compensation I shall call minimum wage. Above this minimum he should receive when at work at his trade a different and larger sum, equivalent to the current wages of his trade but in reality made up of two distinct parts, namely, the minimum wage and an increment due to him for his profession or trade. We have in this the basis of the present daily wage system relative to time. Beyond this, however, for future just and peaceable relations between employer and employee, comes the most important part of the wage earner's reward, namely, what is due him for exceptional and unusual co-operation either of mind, body, or both. I believe that in the old days of privateering the sailor who first sighted a vessel subsequently captured was entitled to special prize money, and in war, actions of exceptional personal gallantry are specially rewarded. From the nature of the case this third increment of wages, corresponding to the contingent fee of the lawyer, must be fluctuating. In many cases the earning of this professional wage does not imply harder or most exhausting work, but more intelligent and co-operating work. It implies use of heart and head in addition to use of hands and eyes.

*Extract from a paper by H. Emerson read at the joint meeting of the American Society of Mechanical Engineers and the Institution of Mechanical Engineers, June, 1904.

### Brown's Discipline.

The Superintendent of the Eastern Division of the Wabash has issued his monthly statement showing the standing of employees. The demerit marks were unusually light for the month of May, and no employee was assessed more than 15. Four engineers, a fireman, seven conductors, four brakemen, four switchmen, a clerk, two agents, four operators and one helper each received from five to 15. One operator was dismissed from the service for leaving his office without permission. Engineer Sampson, Conductors Cook and Gibson, Brakemen Herberg and Nuelkin, and Switchman Conner were each awarded five credit marks for discovering disabled cars in moving trains, thus avoiding accidents. Engineer Furgeson received five credit marks for prompt action, avoiding delay to a train. Fireman Dawson and Brakeman Stinses five each for discovering and extinguishing fires, and Conductor Biehler for making a good run between Peru and Tilton.—*Toledo Blade.*

### A Large Dredging Contract.

A contract which has been under consideration for some time was last week let by the War Department for dredging the canal

through Lake St. Clair, Mich., to M. Rabbitt & Sons Company, of Toledo, Ohio, at its bid of $361,000, the lowest bid received.

### Harris Palatial Car Company.

Louie J. Harris, the patentee of the sleeping car "Jeannette," which was described in the *Railroad Gazette* in 1890, has again appeared in the railroad world; he has a new company, under the above name, which has been incorporated in New Jersey and which proposes to build a train of six cars to be used for transcontinental excursions. Patents on additional improvements have been granted, the last one being dated Aug. 25, 1903. The new company has an office at 35 Nassau street, New York City, and the directors are: L. J. Harris (President), W. Myron Reynolds (Vice-President), Louis E. Rich (Secretary and Treasurer), Frank H. Wendell and J. O. Fowler, Jr.

### The Pintsch Lighting System.

The Safety Car Heating & Lighting Company, New York, issues a statement from the Julius Pintsch Company, of Berlin, which embraces the statistics of the application of the Pintsch system of lighting to railroad cars, locomotives and buoys and beacons throughout the world. The figures given show that 130,138 cars, 5,806 locomotives and 1,703 buoys and beacons are equipped with this system. The statement says that 372 gas works are now in operation to manufacture gas for the Pintsch system of lighting. Of the above figures, Germany leads the list of foreign countries which use Pintsch gas with 45,200 cars and 5,583 locomotives equipped with this system of lighting. The United States is second, with 23,500 cars, and England third, with 21,100 cars.

### A New Lining for Refrigerator Cars.

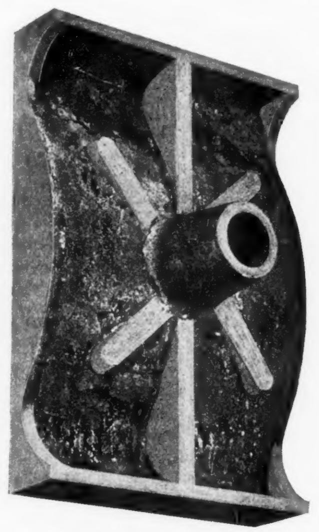
A new lining for refrigerator car insulation has recently been placed on the market by the H. W. Johns-Manville Co., New York. It is known as "Arctic" brand of Keystone hair insulator and its distinctive characteristic is that, while it possesses the insulating properties of hair felt, it combines the papers used in connection with that insulator, so that instead of applying three layers, the "Arctic" can be applied in one. It consists of regular felting hair fastened to and enclosed by two layers of waterproof paper. Tests have demonstrated it to be quite equal to hair felt. It is furnished in lengths sufficient to reach around a car and wide enough to extend from the sill to the roof-plate. This does away with joints and saves in labor and waste. For the floors and roofs, the "Arctic" is furnished according to specifications to fit the nailing strips and carlines respectively. It is made from $\frac{3}{8}$ in. to $\frac{3}{4}$ in. thick, according to the quantity of hair used.

### Interlocking in Texas.

The number of grade crossings of railroads in the State of Texas which are equipped with interlocking signals is 38, and 30 others have been planned for and ordered by the State Railroad Commission. The commission intends to order the installation of interlocking at 15 or 20 more within the next 12 months. In the 38 plants now in use the number of working levers is 820, and 15 of the machines are "all-electric" power. In the blank which the Railroad Commission has recently sent out for monthly reports, the railroad in charge of the interlocking is required, in every case, not only to report on the general condition of the plant, but to answer specifically whether or not annunciators and track circuits have been out of service during the month. The monthly reports have to be filed at Austin within 15 days after the end of the month. A code of rules governing interlocking plants has been approved by the commission, and this code has now been adopted by practically all of the railroads of the State. The all-clear indication at night is green and the adverse indication in distant signals is yellow. The arms of distant signals are painted yellow, and when signals are out of order and a hand signal must be given, the flags or lamps used must be yellow.

### Drop Forged Follower Plate.

The Allegheny Forging Co., Pittsburg, Pa., has brought out a design of drop forged one-piece follower plate for spring draft gears. It is lighter than the riveted thimble plates usually used and saves the expense to the



Drop Forged Follower Plate.

railroads of drilling the riveted hole, countersinking and riveting the thimble to the plate. The accompanying drawing shows the design intended for a single spring gear. It is $6\frac{1}{8}$ in. x $8\frac{1}{2}$ in. and weighs $17\frac{1}{2}$ lbs. as against about 24 lbs. for the ordinary riveted thimble plate. The four radial ribs and the rib along the center give a bearing for both coils of the spring which also bear on the highest point of the curved body of the plate. None of the trouble from broken rivets or thimbles is experienced with these followers.

### Bids for Staten Island Ferry Boats.

Bids from eight firms were opened June 11 by the Department of Docks, New York City, for building five ferry boats for the Staten Island line. Bids were submitted for two classes of boats, one calling for Babcock & Wilcox, or Niclausse boilers; the other for Seabury Mosher, or Hoehenstein boilers. The bids were as follows: Harlan & Hollingsworth, for the former type, one boat, $362,000; one additional, $341,000; second additional, $331,500; for the second type, $341,000, $320,000 and $312,000. Bath Iron Works, for the first type, $355,900, $347,900; second type, $340,100, $332,100. Eastern Shipbuilding Co., for the first type, $350,000, $345,000; second type, $335,245, $326,245; W. & A. Fletcher Co., for the first type, $365,000, $346,300; second type, $365,000, $346,300; William Cramp's Sons Ship & Engine Building Co., for the first type, $350,000, $340,000; second type, $340,000, $330,000. Maryland Steel Co., for the first type, $365,500, $349,200, $341,700, $327,600, $325,000; second type, $351,500, $337,000, $331,200, $319,000, $317,000. Burlee Dry Dock Co., Staten Island, first type, $345,000, $341,000; second type, $335,000, $329,000. N. F. Palmer Quintard Iron Works, first type, $352,000, $347,000; second type, $338,000, $333,000. Millard & Maclean designed these boats, which are to be 250 ft. long, 66 ft. over guard, and 41 ft. over the hull.

### Bethlehem Steel Company's Exhibit at St. Louis.

The exhibit of the Bethlehem Steel Co., of South Bethlehem, Pa., in the Mines and Metallurgy Building, occupies 120 ft. x 62 ft., fronting the northeast entrance. Two-thirds of the space (80 ft. x 62 ft.) is below the floor level of the building, on account of the great weight of many of the exhibits, so as to set them on the ground. The exhibit includes iron, carbon steel and nickel steel castings, finished guns and carriages which have been designed and built for land and naval service, and large and small carbon and nickel steel forgings in different stages of completion. There are also exhibited tested armor plate and a full-sized model of a finished armor plate and of an ingot of the size required in its manufacture. An exhibit which shows the operations required to make a finished armor plate from the ore, the amount as well as the nature of the materials consumed, and, also, the time taken by each operation, is placed on stands which extend along the walls of the depressed floor space, and on the walls are photographs showing views of the company's plant and of manufactured material. On the main floor level is a battleship turret with two 12 in. guns with a rapid ammunition handling device, operated by electricity. Lighter ordnance material, ammunition, and small castings and forgings are also shown.

### Pig Iron Production for May.

The report of the anthracite coal and coke pig iron production for the month of May as published in the last issue of the *Iron Age* shows a falling off on June 1 of 22,000 tons from the last report. The total production for May was 1,533,350 tons as against 1,555,267 tons in April, 1,447,065 tons in March, 1,205,449 tons in February, and 921,231 tons in January. The rate of production per week on June 1 was 336,197 tons as compared with 368,244 tons per week on May 1. Returns from the various furnaces show that this falling off occurred mainly in the Pittsburg, West Pennsylvania, Illinois, Shenango Valley and the Central and Northern Ohio districts. The Mahoning and Lehigh Valley districts, on the other hand, continue to show gains over the previous month. This decrease in production has been accompanied by the blowing out of several furnaces, reducing the number in blast from 231 on May 1 to 213 on June 1. Merchant stocks, which were declining steadily during the first quarter of the year, have had an increase of 102,000 tons during May, the total on hand being 545,892 tons as compared with 444,059 tons in April. This increase brings the total number of merchant stocks now held by the various steel companies almost up to the total for January, which was 576,402 tons. Of this increase of 102,000 tons, 67,000 tons, or over two-thirds, is credited to the Central and Northwestern division, which includes Western Pennsylvania, the Shenango and Mahoning valleys, the Hanging Rock region, Central and Northern Ohio, Michigan, Illinois, Wisconsin, Minnesota and Missouri. This indicates quite a shrinkage in the demand, which even the blowing out of furnaces and the cutting down of production will hardly counterbalance. Returns from the various plants of the United States Steel Corporation show a total production of 972,534 tons for May, as compared with 974,006 tons for April, 913,412 tons for March, 502,994 tons for January, and 406,730 tons for December. In this connection, it is interesting to note that the demand for steel billets is still very light. Several large orders for steel cars have, however, increased

the demand for plates, and structural steel is also in demand owing to long delayed Baltimore orders which have just begun to come in. The demand for bars is poor and the cutting in prices is still going on, especially in the West.

### The Buhoup 3-Stem Coupler.

The Buhoup 3 stem coupler equipment was brought out about seven years ago and is now in service on several thousand passenger cars on some of the largest railroads in the country. The Pennsylvania, Southern, Erie, Big Four, Chesapeake & Ohio and the Pullman Company have most of their cars equipped with it. The desirable features which the makers claim for it, over the single stem coupler, are: Greater strength, on account of its having three draft stems instead of one; greater draft spring resistance, with three draft springs instead of one, and a rotating pivoted head with lateral motion of the center stem in the stirrup or carrier iron, which relieves the side strains on the platform when rounding curves and also decreases flange wear. The McConway & Torley Company, makers of the device, are now calling attention to the desirability of applying it to heavy freight cars as well as passenger equipment, because the same features which commend it for passenger cars would be valuable on freight cars. Although the equipment for freight service would cost considerably more than the ordinary single stem coupler, the claim is made that the saving in maintenance of the draft gear and, in fact, the whole car, would more than offset the greater first cost. Two freight cars of 80,000 lbs. capacity, fitted with this equipment, were exhibited at the convention at Old Point Comfort in 1899. These cars have been in continuous service since that time and an examination some months ago showed the coupler and draft gear to be in as good condition as when applied. No repairs of any kind had been made during that time. Fifty steel cars of 100,000 lbs. capacity have been equipped with 3-stem couplers on the Bessemer & Lake Erie and have been in service more than a year with satisfactory results. Part of the exhibit of the McConway & Torley Co. at the convention at Saratoga this year will consist of models of the device applied to freight cars to show its adaptability for that kind of cars.

### Manufacturing and Business.

The Gould Coupler Co. has removed its New York office from 25 West Thirty-third street to 1 West Thirty-fourth.

The Record Foundry & Machine Co., of Livermore Falls, Me., will soon build a brick machine shop and foundry 60 x 184 ft.

The Davis Calyx Drill Co., of New York, has opened an office in the Johnston Building, Cincinnati, Ohio, in charge of Mr. John F. Munn.

John Munhall, of Pittsburg, one of the founders of the United States Steel Corporation, died at Atlantic City, N. J., June 9, at the age of 71.

The Kabley Foundry Co., of Worcester, Mass., will put up a new brick and steel foundry 80 ft. x 200 ft., which will be equipped with a 10-ton traveling crane.

Dominic I. Murphy, who was Commissioner of Pensions under President Cleveland, was elected on June 7 by the Panama Canal Commission as Secretary of that body.

The Barney & Smith Car Company's annual report for the year ending March 31 shows net profits of $633,553 as compared with $566,261 for the previous year, and a surplus of $373,553 as compared with $302,511.

The Independent Railroad Supply Company, Chicago, has recently shipped 11 miles of Wolhaupter rail joints for the 100-lb. rail to be used on the Chicago, Milwaukee & St. Paul.

The Bignall & Keeler Manufacturing Co., Edwardsville, Ill., has an interesting exhibit of improved pipe-cutting and threading machinery in Block No. 11, Aisle B-2, Machinery Hall, World's Fair.

The Central Car Wheel Company of Pittsburg has lately filled an order for car wheels for Corea. Owing to the unsettled condition of the country on account of the war, shipment is postponed.

The Reliance Coal Co. is having plans made by Kingsley & Prescott, of Scranton, Pa., for building a coal breaker at Upper Pittston, Pa. The company will put in engines, conveying machinery, etc.

The Temiskaming & Northern is asking for bids for furnishing 75,000 ties to be delivered at points along its right of way. Address the company's engineer at North Bay or the Secretary, P. E. Ryan, Toronto.

At the annual meeting, June 7, of the Western Tube Co., Kewanee, Ill., the following officers were elected: President, A. M. Hewlett; General Manager of Sales, John Duncan; Secretary and Treasurer, C. E. McCullough.

The Pennsylvania Malleable Company of Pittsburg has added another open-hearth furnace to its plant to supply steel blanks to the Schoen Steel Wheel Company, which adjoins the Malleable Company's works at McKees Rocks, Pa.

The Hefferman Engine Works will soon commence work on its new machine shop and other buildings, at Seattle, Wash., for which the site has already been bought. Orders for a large amount of new machinery are yet to be placed.

The new sheep sheds of the New York Central & Hudson River at East Buffalo, which are the largest of the kind in the world and will hold about 4,500 head, have been completed, replacing those destroyed by fire last February.

The plant of S. C. Boocks & Company, 2625 Liberty avenue, Pittsburg, Pa., is especially equipped to make light forgings and to do general blacksmithing. The company, besides making contractors' and erectors' tools, derrick irons, etc., is making a specialty of car forgings.

The Ashton Valve Company, Boston, Mass., announces that J. W. Motherwell is now associated with the railroad department of their company, with headquarters at 160 Lake street, Chicago, Ill. Mr. Motherwell has, for the past 11 years, been connected with Fairbanks, Morse & Company.

Mr. E. L. Janes, Chief Clerk of the Motive Power Department of the Boston & Albany and Secretary of the New England Railroad Club, has resigned his place with the B. & A. and will take a position with the American Brake Shoe & Foundry Company, of New York. It is understood that Mr. Janes will retain the club secretaryship.

The Standard Supply & Equipment Company, of New York, Philadelphia and Baltimore, has been appointed Eastern Representative of the Flannery Bolt Company, Pittsburg, maker of the Tate flexible locomotive staybolt which was described in the *Railroad Gazette* April 29. J. R. Flannery & Company, Chicago, are the Western Representatives.

The Canadian Westinghouse Company, Ltd., announces in a circular, printed in both French and English, the approaching completion of its plant in Hamilton for the manufacture of electrical apparatus. This plant will be equipped with the latest improved machinery and will give employment to over 1,000 men. The company is already prepared to fill orders.

The Stetson Lumber Company, Macon, Ga., manufacturers of and dealers in long leaf yellow pine for car sills, heavy building and bridge timbers, reports that it has been shipping much high grade material to railroads, there being practically no demand for low grade this year. The company has a capacity of 75,000 ft. per day, and it expects to increase it considerably.

The Buckeye Jack Mfg. Co., of Louisville, Ohio, has been reorganized and incorporated under the laws of the State of Ohio with the following officers: O. F. Transue, President; Frank Transue, Vice-President; E. C. Bates, Secretary and Treasurer, and N. Falla, Superintendent. The factory and office will be at Louisville, Stark County, Ohio, where all communications should be addressed.

The New York Continental Jewell Filtration Co. has recently closed, through its Chicago office, contracts with the Waterloo Water Co. for a filter of 500,000 gal. daily capacity; with the Chicago & Eastern Illinois R. R. for a filter of 500,000 gal. daily capacity, to be installed at Villa Grove, Ill.; and with the Southern Pacific R. R. for a filter plant of 400,000 gal. daily capacity, to be installed at Yuma, Ariz.

The Pennsylvania Railroad, it is reported, has given a contract to the American Cement Co., Philadelphia, for the cement which will be used in its new tunnel from Weehawken under the North River, Manhattan Island, and the East River to Long Island City, and for the new terminal stations and power houses connected with this work. This is probably a larger contract than that given to the same company for the New York City subway, which was for about 1,500,000 barrels of cement.

Milliken Bros., of New York City, it is reported, have been awarded the contract for the steel to be used in building the power station of the Manila Electric Lighting & Traction System. The contract for the building has been given to J. G. White & Co., of New York. This establishment will be operated by an American syndicate, in which Charles M. Swift, of Detroit; J. G. White, of New York; ex-President Buhl, of the Sharon Steel Co., and the Westinghouse interests are concerned. The cost of the work will be about $2,500,000 and it is expected that the lines will be in operation at the end of the present year.

The business of the Climax Stock Guard Co., Chicago, for April and May is indicated by the following list of sales for those two months: April.—Chicago & Alton, one car; Columbus, Buckeye Lake & Newark Traction Co., two cars. Less-than-carload orders from the Danville Street Railway & Lighting Co., the Chicago, St. Paul, Minneapolis & Omaha R. R. and the Big Sandy, East Lynn & Guyan R. R. May.—Chicago & Alton, two cars; Milwaukee & St. Paul, six cars; Comstock-Haigh-Walker Co., one car, and a l.c.l. order from the Portsmouth Street Railway & Lighting Co. The company has a statement from the C., M. & St. P. of the entire breakage from all causes of Climax guards on that road covering a period of from one to three years, which shows that the average expense for maintenance and renewal was 15 cents per guard per year.

The Sligo Iron & Steel Company, suc-

cessor to Phillips, Nimick & Company, has completed its new rolling mills at Connellsville, Pa., to which place the business was removed from the South Side, Pittsburg, Pa., because the property there had to be given up to permit the Wabash to build its bridge over the Monongahela. The company makes "Sligo" stay-bolt iron, "Tyrone" bar iron, charcoal iron, plates, sheets, and angles, and tees and light rails. The office and warehouse of the company remains at Carson street, Pittsburg, on part of the site of the old mills. The "Sligo" bar iron, produced by this company, is made from cold blast charcoal pig hammered and rerolled. It is of high tensile strength and ductility, and is used for locomotive staybolts and similar uses. Crown iron, made by the company, is used for engine bolts, also in plates and sheets. The company prints a pamphlet describing its numerous products.

### Iron and Steel.

The United States Steel Corporation, it is reported, has orders for 1904 delivery for rails amounting to about 60 per cent. of last year's production, which was 1,934,315 tons. The Illinois Steel Co.'s orders will keep its rail mill busy on full time for the balance of the year.

It is reported that G. E. Townsend, of Indianapolis, and Ralph E. Beach, of New York, are interested in an American syndicate which has recently bought the iron fields and steel works of Manuel Corauera, at Terria Detula, Western Mexico, at about $2,000,000 for the property. The works will be equipped to make rails and structural steel of all kinds.

The Hyle Steel Tool Co., of Syracuse, N. Y., at its annual meeting, June 9, elected the following officers: President, William A. Hyle; Vice-President, James S. Gordon; Secretary, Charles M. Bedell; Assistant Secretary, C. C. Warren; Treasurer, Lewis A. Leonard; Attorney, William Rubin; Executive Committee, William A. Hyle, Lewis A. Leonard and Charles M. Bedell. The work of building the shops is progressing rapidly.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 30.)*

### National Association of Traveling Freight Agents.

The National Association of Traveling Freight Agents, at its meeting held on June 10, elected the following officers: President, John C. Wood, Cleveland; Vice-Presidents, George Needham, Buffalo, Renfro Jackson, Atlanta; Secretary, E. E. Delaney, Buffalo; Treasurer, H. K. Miles, Cincinnati. Buffalo was chosen as the next meeting place.

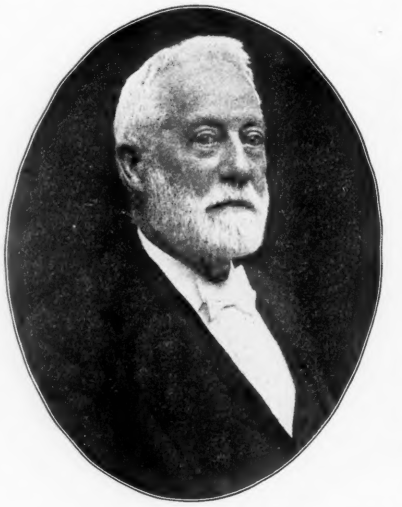
## PERSONAL.

—Prof. W. F. M. Goss, Dean of the Schools of Engineering of Purdue University, La Fayette, Ind., has received the honorary degree of Doctor of Engineering, the degree having been conferred by the University of Illinois on the 8th of June.

—Mr. Arthur S. Hobby, Associate Member of the American Society of Civil Engineers, Guantanamo, Cuba, has resigned his position on the Guantanamo Railroad and intends to devote his attention to other interests in that region.

—Mr. J. J. Purdon, District Superintendent of the Atlantic Coast Line, died at Jacksonville, Fla., recently.

—Mr. Edwin Dean Worcester, for many years Secretary of the New York Central & Hudson River, died suddenly at his home in New York City on June 13. Although Mr. Worcester had been ill for several weeks death was unexpected. He was born in Albany, N. Y., 76 years ago. Mr. Worcester's railroad experience was very unusual. He had served continuously for 40 years with the New York Central, 20 years with the Lake Shore, and 14 with the Michigan Central, so that his service extended over the



entire period of present railroad development. After receiving a public school education Mr. Worcester became a clerk in the law office of Rufus W. Peckham. In mercantile business while less than 21 years old, he was put in charge of the mechanical part of the Ransom Stove Works of Albany. When the New York Central Company was formed, in 1853, Mr. Worcester became its Treasurer, and after the consolidation with the Hudson River Company, in 1869, he was made Treasurer of the new company, and afterwards became Secretary. Early in 1873 he became Secretary and Treasurer of the Lake Shore & Michigan Southern. Five years later when Mr. Vanderbilt (with whom his relations were close and intimate) secured control of the Michigan Central, Mr. Worcester took the Secretaryship of that company. In the latter part of 1883, when the organizations of the Lake Shore and the Michigan Central were changed, he was chosen to be Vice-President of each, continuing to be Treasurer and Secretary of the former and Secretary of the latter, as well as Secretary of the New York Central & Hudson River, in addition to which he held official relations with a number of auxiliary lines. Holding high place for a lifetime in a progressive corporation, and in this case while developing a new art, occurs only when the man has either control or indispensable qualities. Although no one is really indispensable, nevertheless Mr. Worcester came to be so regarded and trusted by successive administrations. In the building up of the present great system by leases and consolidations, in the planning and issue of securities, he not only had full knowledge of every detail, but he originated and carried out much. One of his brother officers says of him: "He was a great financier and knowing the company's whole history, he never forgot anything. In financiering he never needed a lawyer; he could do it all."

—Mr. F. Wolcott Jackson, Resident Manager of the Pennsylvania Railroad lines in New Jersey, died at his home in Newark, N. J., on June 14, at the age of 71. Mr. Jackson was stricken with heart disease while riding in a train near Trenton on Tuesday of this week.

—Mr. F. F. Busteed, the new Assistant Chief Engineer of the Canadian Pacific, was born at Battery Point, Quebec, in 1858, and was a student at Campbellton, N. B., and Montreal High Schools and McGill University. His first railroad service dates from 1879, when he began on the Canadian Pacific as a chainman. For two years from 1881 he was a transitman; then for four years was Assistant Engineer on construction. In 1890 he resigned and went to the Canada & Great Falls Railway. After serving with this company for a time he went south and for about two years was City Engineer of Bristol, Va. About twelve years ago he returned to the Canadian Pacific as a rodman and has been successively Assistant Engineer, Resident Engineer, Engineer of Maintenance of Way and Structures, Division Engineer and Superintendent, from which latter position he is now promoted to be Assistant Chief Engineer.

—Mr. H. L. Fry, who for the past five years has been Roadmaster and Resident Engineer of the Southern Railway at Greensboro, N. C., has been promoted to be Engineer of Maintenance of Way. He is a native of Richmond, Va., and began his railroad work as Roadmaster on the Chesapeake & Ohio. Later he became Assistant Engineer and Resident Engineer. From 1873 to 1875 he was Resident Engineer on the Carolina Central. In 1880 he resigned from this road to go to the Richmond & Danville as Assistant Supervisor of Bridges and Supervisor of Track, and for 13 years (1886-99) he was on the Cape Fear & Yadkin Valley, finally becoming Chief Engineer of that company. Mr. Fry's service on the Southern began in 1899.

—Mr. Dennis Sullivan, whose promotion to the General Superintendency of the El Paso-Northeastern, was recently announced, was born at California, Mo., in 1860. His

first railroad service was as a messenger at Pleasant Hill, Mo., on the Missouri Pacific. Later he was an operator and train despatcher. In 1881 he resigned from this road and went to Big Springs, Texas, where he was chief despatcher on the Texas & Pacific. In 1885 he returned to his native State and took a similar position on the Missouri, Kansas & Texas. Then for nine years, 1890-99, he was trainmaster of the Choctaw Division at Dennison, Texas, and from 1899 to 1902, Superintendent of that division.

The next year (1903) he was appointed Trainmaster of the Dawson Railway, and in April of this year was made Superintendent of Transportation of the El Paso-Northeastern System, with office at Alamogordo, N. Mex., and three weeks after was chosen to be General Superintendent of the company.

—Mr. J. E. Sague, M.E., who was last week elected Vice-President of the American Locomotive Company, was born in Poughkeepsie, N. Y., in 1862. He graduated in 1883 from Stevens Institute and soon after was employed in the office of the Mechanical Engineer of the West Shore. In the year following he entered the drawing office of the Chicago, Burlington & Quincy, and after serving as Assistant Engineer and, later, as Engineer of Tests, became in 1886 Engineer of Tests for the Erie. While on the latter road he was also General Foreman of the Jersey City shops and Master Mechanic at Rochester. From 1890 to 1892 Mr. Sague was Superintendent of Motive Power of the Jamaica Railroad and Mechanical Engineer for the West India Improvement Company. His connection with the locomotive building industry dates back to 1892, when he was appointed Mechanical Engineer of the Schenectady Locomotive Works, which office he held until the formation of the American Locomotive Company. In June, 1901, he came to New York as Mechanical Engineer of the new company, and in March of this year was made Assistant Vice-President.

—Mr. Leigh Best, Secretary of the American Locomotive Company, has also been elected Third Vice-President. Mr. Best, like his present associates, has been identified with the company since its origin and as assistant to President Callaway handled many of the executive details. Before going to the American Locomotive Company Mr. Best was Assistant to the President of the New York Central. Mr. Best's business career is most interesting; born in Chatham, N. Y., Nov. 4, 1867, he started work at an early age in a paper mill owned by his father, leaving there to serve as clerk in a general store. He later entered Government employ in the village postoffice. Up to this time Mr. Best had managed, by devoting all his spare time to study, to prepare himself for college, but ill health compelled him to sacrifice his ambitions in that direction. At the age of 19 he found employment as stenographer in the office of D. H. Burrell & Company, manufacturers, at Little Falls, N. Y., and two years later entered the law office of Miller, Fincke & Brandegee, Utica. For more than seven years, 1892-1900, Mr. Best was in the law department of the New York Central, a greater part of the time as confidential assistant to the general counsel. His duties in connection with the latter position brought him in frequent contact with Mr. Callaway, then at the head of the New York Central, who recognized his ability, and in October, 1900, made him Assistant to President.

## ELECTIONS AND APPOINTMENTS.

*Canadian Pacific.*—J. A. Macgregor has been appointed Assistant Superintendent of Car Service of the Western Lines, with office at Winnipeg.

*Cane Belt.*—W. T. Eldridge, Vice-President, General Manager and General Freight and Passenger Agent, has resigned.

*Chicago & North Western.*—The South Platte and Eastern Districts have been consolidated, and will be operated as the Eastern District. The jurisdiction of C. H. Reynolds, Superintendent, has been extended over the lines formerly operated as South Platte District.

*Chicago, Rock Island & Gulf.*—F. E. Mitchell has been appointed Secretary and Treasurer, with office at Fort Worth, Texas, succeeding L. K. Luff, resigned.

*Chicago, Rock Island & Pacific.*—The headquarters of William J. Leahy, Assistant General Passenger Agent, have been transferred from Chicago to St. Louis, where he will relieve Alexander Hilton, General Passenger Agent of the St. Louis & San Francisco, the latter to devote his attention exclusively to the interests of the Frisco.

*Colorado & Southern.*—B. F. James has been appointed Assistant Secretary and Assistant Treasurer, with office at Denver, succeeding H. Van Mater, resigned.

*Des Moines & Fort Dodge.*—At a meeting held recently Richard C. Lorch, Walter S. Crandall and A. C. Doran were elected Directors.

*Detroit & Toledo Shore Line.*—T. P. Shonts (President of the T., St. L. & W.) has been elected President, and F. W. Morse (Third Vice-President of the Grand Trunk) has been elected Vice-President. J. H. Muir was made Secretary and Treasurer.

*Florence & Cripple Creek.*—The office of Chief Engineer M. J. Burgdorf has been removed from Cripple Creek, Colo., to Canon City.

*Georgia, Florida & Alabama.*—The following appointments have been made: R. B. Coleman, General Freight and Passenger Agent, office at Bainbridge, Ga. W. H. Carroll, Auditor, office at Tallahassee. D. F. Chittenden, Assistant to the General Manager, with jurisdiction in the operating department between Tallahassee and Apalachicola, with office at Tallahassee. F. P. Damoh, Chief Engineer in charge of maintenance of way, with office at Tallahassee, and J. J. Anderson, Master Mechanic, with office at Bainbridge, Ga., succeeding W. E. McCarthy, resigned.

*Lake Superior & Ishpeming.*—J. F. Deimling, Chief Engineer, has resigned.

*Lehigh Valley.*—L. L. Bently has been appointed Mechanical Engineer, with headquarters at South Bethlehem, Pa.

*Memphis Car Service Association.*—J. H. Sullivan has been chosen to succeed R. A. Macdonald as Manager.

*Mexican Central.*—G. C. Kolff has been appointed Auditor of Receipts, with office at Mexico, succeeding E. C. Buchanan, resigned.

T. Mason, Assistant to the General Manager, has resigned.

*National of Mexico.*—D. P. Bennett has been appointed Assistant to the President, with office at City of Mexico, succeeding Jackson Smith, who has been appointed Assistant to the First Vice-President.

*Newton & Northwestern.*—The officers of this company are: Vice-President, F. A. Farrar; Treasurer, Homer Loring; Secretary, C. F. Cushing; Assistant Treasurer, C. E. Rice, and Auditor, R. K. Stuart.

*New York & Ottawa.*—H. K. Gays has been appointed Assistant General Passenger Agent.

*Oregon Short Line.*—B. F. Forbes has been appointed Superintendent of Telegraph.

*Pacific & Idaho Northern.*—Edgar M. Heigho has been appointed General Manager, with office at Weiser, Idaho, succeeding P. P. Shelby, resigned. The office of Auditor has been abolished.

*Paris & Great Northern.*—A. Sherry has been appointed Chief Engineer and C. E. Boss, hitherto Master Mechanic, has been appointed Superintendent of Motive Power.

*Pawnee.*—The officers of this company are: F. S. Peabody, President; J. J. Hart, Vice-President and Manager; F. W. Upham, Second Vice-President; C. J. Gray, Secretary, and J. D. Adams, Treasurer. The general offices are at Chicago, Ill.

*Pere Marquette.*—That part of the P. M., heretofore known as the Detroit district, including the Toledo terminus, has been merged into the Grand Rapids and Saginaw Districts, and the operating department, including the train despatcher's office, has been removed from Plymouth to Saginaw. A. R. Merrick, formerly in charge of the Saginaw District, succeeds Mr. Halsted in charge of the Toledo territory, while P. N. Place continues as Superintendent of the Grand Rapids Division.

*Pittsburg & Lake Erie.*—R. V. Wright, Mechanical Engineer, has resigned.

*St. Clair Terminal.*—The officers of this company, are: President, J. H. Reed; Vice-President, D. M. Clemson; Treasurer, G. W. Kepler; Secretary and Auditor, Wm. J. Post; Traffic Manager, L. C. Bihler, and Superintendent, J. W. Crisfield.

*St. Louis & San Francisco.*—See Chicago, Rock Island & Pacific.

*Savannah & Statesboro.*—The office of Cecil Gabbett, President and Treasurer, has been removed from Savannah, Ga., to Statesboro.

*Southern.*—H. L. Fry has been appointed Engineer of Maintenance of Way, with office at Greensboro, N. C., succeeding R. Southgate, deceased.

*Tehuantepec National.*—G. L. Hatley has been appointed Terminal Superintendent at Coatzacoalcos, Mex., succeeding J. M. Stickel, resigned.

*Wadley & Mt. Vernon Extension.*—The officers of this company are: President, T. J. James, Adrian, Ga.; Vice-President, J. McLean; General Freight and Passenger Agent, Wm. Touchston, and Secretary and Treasurer, C. E. Baker, all with offices at Douglas, Ga.

*Western Railway Weighing Association and Inspection Bureau.*—F. O. Decker, hitherto General Manager of the Birmingham Belt, has been appointed Superintendent of these associations, succeeding George L. Carman, who has resigned owing to ill health.

## LOCOMOTIVE BUILDING.

*The Stillmore Air Line* is having two locomotives built at the Baldwin Locomotive Works.

*The Norfolk & Western* has ordered seven simple consolidation (2-8-0) locomotives from the American Locomotive Co., in addition to the seven ordered from the Baldwin Locomotive Works.

*The Norfolk & Western* has ordered seven simple consolidation (2-8-0) locomotives from the Baldwin Locomotive Works. These locomotives will weigh 175,000 lbs., with 150,000 lbs. on the drivers; cylinders, 21 in. x 30 in.; diameter of drivers, 56 in.; radial stay boiler, with a working steam pressure of 200 lbs.; heating surface, 1,964.37 sq. ft.; 213 tubes, 2¼ in. in diameter and 14 ft. 6 in. long; carbon steel fire-box, 112½ in. long and 64¼ in. wide; grate area, 47.3 sq. ft.; tank capacity, 6,000 gallons of water, and coal capacity, 10 tons. The special equipment includes: Westinghouse air-brakes, Magnesia sectional boiler lagging, Lewis-Seley couplers on pilot, Monitor injectors, U. S. metallic piston and valve rod packings, Ashton safety valves, Leach sanding devices, and Nathan sight-feed lubricators.

*The Seaboard Air Line*, as reported in our issue of June 10, is having 10 simple Consol-

idation (2-8-0) locomotives built at the Baldwin Locomotive Works. These locomotives will weigh 175,000 lbs., with 155,000 lbs. on drivers; cylinders, 21 in. x 30 in.; diameter of drivers, 56 in.; wagon-top boiler, with a working steam pressure of 200,000 lbs.; heating surface, 2,989 sq. ft.; 360 tubes, 2 in. in diameter and 15 ft. 2 in. long; fire-box, 99 in. long x 66 in. wide; grate area, 45.4 sq. ft.; tank capacity, 6,000 gallons of water, and coal capacity, 10 tons. The special equipment includes: Westinghouse-American brakes, hammered steel axles, sectional Magnesia boiler lagging, Tower couplers, 16-in. oil headlights, Hancock No. 10 injector, solid I-beam brake-beams, United States piston-rod packings, Star safety valves, Leach sanding devices, Nathan double sight-feed lubricators, and Railway Steel-Spring Co.'s springs.

## CAR BUILDING.

*The American Car & Foundry Co.* has miscellaneous orders for 56 cars.

*The Ohio & Kentucky* denies that it is in the market for new equipment.

*The Montpelier & Wells River* is having 15 freight cars built by the Laconia Car Co.

*The New Orleans & Northeastern* has ordered one mail car from the American Car & Foundry Co.

*The Southern Pacific* has ordered 750 steel underframe box cars from the American Car & Foundry Co.

*The Denver, Enid & Gulf* is having 25 freight cars built by the Mt. Vernon Car Manufacturing Co.

*The Oregon Short Line* has ordered 250 steel underframe box cars from the American Car & Foundry Co.

*The Southern* has ordered nine combination baggage and mail cars from the American Car & Foundry Co.

*The Louisville & Nashville* is reported to be figuring on 600 box cars and 400 coal cars to be built at the company's shops.

*H. R. Emmerson*, Canadian Minister of Railroads, is reported to have ordered four coaches from the Pullman Co. These coaches are for use on the new Ocean Limited Express of the Intercolonial.

*The DeQueen & Eastern* has ordered 12 logging cars of 60,000 lbs. capacity from the American Car & Foundry Co. The cars will weigh 31,000 lbs., and measure 40 ft. long and 8 ft. 10½ in. wide. The special equipment includes: Damascus brake-beams, Westinghouse air-brakes, Tower couplers and American Car & Foundry Co.'s wheels.

*The Canadian Pacific* will build 100 stock and 85 flat cars of 60,000 lbs. capacity and 25 passenger refrigerator cars of 60,000 lbs. capacity in freight train and 40,000 lbs. capacity in passenger train at its Perth shops. The stock cars will be 36 ft. long, 8 ft. 8 in. wide, and 7 ft. 1¼ in. high, all inside measurements. The flat cars will be 36 ft. 8 in. long, 8 ft. 10 in. wide, over frames, and 4 ft. 2 in. high, from rail to top of floor. The refrigerator cars will be 38 ft. 8 in. long and 8 ft. 11 in. wide, over frames. The special equipment for all includes: M. C. B. axles, Simplex bolsters, with Susemihl side bearings, Simplex brake-beams, Westinghouse air-brakes, Tower couplers, Miner draft rigging, Harrison dust guards, McCord journal boxes and lids, and Barber roller side bearing trucks.

*The New York Central & Hudson River*, as reported in our issue of June 10, has ordered two dining cars from Barney & Smith for August, 1904, delivery. These cars will be 72 ft. 6 in. long outside sills and 81 ft. 3 in. long over all, 9 ft. 8 in. wide outside sills and 10 ft. 1½ in. wide at eaves, and 14 ft. 2¾ in. high from rail to top of roof. The special equipment includes: Westinghouse brakes, M. C. B. axles, Gould couplers, platforms and vestibules, Forsythe curtain fixtures, Pantasote curtain material, New York Central standard heating system, mahogany chair seats and six-wheel trucks.

## BRIDGE BUILDING.

ANDERSON, IND.—Bids, it is reported, are wanted June 20 by Madison County Commissioners for repairs to a number of bridges.

BANGOR, ME.—A contract, it is reported, has been given to the American Bridge Co. for building the steel bridge over the Kennebec River at Skowhegan.

BOSTON, MASS.—Bids are wanted June 21 by the Metropolitan Water & Sewerage Board for building a concrete arch at West Boylston.

CHESHIRE, MASS.—Recent heavy rains destroyed a number of bridges.

COLUMBUS, IND.—The Indianapolis, Columbus & Southern Traction Co., it is reported, has given a contract to the Caldwell & Drake Works, of this place, for rebuilding the bridge over Blue River north of Edinburg, damaged by floods.

COOPERSTOWN, N. DAK.—The County Auditor has been instructed to ask bids for building several bridges in Griggs County. P. A. Melgard is County Auditor.

COSHOCTON, OHIO.—Bids are wanted June 21 by C. A. Lamberson, County Auditor, for the masonry pier, also for the iron superstructure, of a bridge over the Muskingum River at Conesville, in Franklin Township.

DANVILLE, PA.—Bids are wanted July 5 for the bridge over the river which is to have a 24-ft. roadway with 6-ft. sidewalks.

DILLON, MONT.—Plans are being made for building a bridge at Clark street.

DONORA, PA.—Final surveys are being made for the steel bridge authorized by Congress to be built over the Monongahela River from a point in Rostraver Township to Donora, in Washington County.

ELYRIA, OHIO.—Bids are wanted June 20 for building a double arch span over the east branch of Black River at Washington avenue.

KANSAS CITY, MO.—A proposition is now pending in the City Council to require the Metropolitan Street Railway, the Missouri Pacific and the Chicago & Alton to build a viaduct over the railroad tracks on Lydia avenue.

The bridges damaged by recent floods are the Rock Island, the James street, the Kansas City Southern, the Chicago Great Western and the Belt Line.

LINCOLN, NEB.—Bids are wanted June 20 by F. A. Houston, County Clerk, for building a steel bridge near Harbine, in Jefferson County.

LONDON, ONT.—The Southwestern Traction Company will build five steel bridges on its electric line to St. Thomas and Port Stanley. The longest will be over the ravine to the south of St. Thomas, which, it is estimated, will cost $50,000.

MONTGOMERY, ALA. — The Montgomery Bridge & Improvement Co. has been incorporated in Alabama to build a steel highway toll bridge 800 ft. long and 20 ft. wide to cost about $80,000, over the Alabama River two miles above Montgomery. W. H. Converse, of Chattanooga, Tenn., is President; Belton Mickle, of Montgomery, Vice-President, and J. G. Lankester, of Jasper, Secretary and Treasurer.

MOUNT GILEAD, OHIO.—Separate bids are wanted June 30 by the Commissioners of Morrow County for the substructure and the superstructure of a steel bridge 90 ft. long with 18-ft. roadway over Whetstone Creek in Gilead Township.

MT. MORRIS, N. Y.—It was voted at a recent meeting to bond the town for $10,000 to build two iron bridges, one over the Genesee River between this place and Castile, and the other over the Kiskequa Creek at Tuscarora.

NAPA, CAL.—Plans for a bridge to be built at Seminary street call for a stone arch 60 ft. long with a span of 42 ft. The clerk has been authorized to ask bids.

OMAHA, NEB.—The City Council, at a special meeting, has passed the ordinance providing for vacating of certain streets and for the building of the new steel viaduct by the Chicago, Burlington & Quincy, on which work will soon be commenced.

PITTSBURG, PA.—A recent court decision compels the Montour Railroad Co. to rebuild two bridges on the Hookstown road which were carried away by floods last March.

PORTLAND, ORE.—The City Council recently passed a resolution to build two steel bridges, one over the gulch in Union avenue, at a cost of $55,000, and one at Grand avenue, to cost about $45,000.

RIPLEY, W. VA.—Bids are wanted July 11 by G. B. Crow, County Clerk, for building an iron bridge over Poca River in Jackson County.

RISING SUN, IND.—Bids, it is reported, are wanted July 2 by the County Commissioners for building an iron or concrete steel bridge 93 ft. long with 12-ft. roadway. J. W. Corson is Auditor.

TOWANDA, N. Y.—The American Bridge Co. has taken the contract to build two new spans, to take the place of one span, 125 ft. long, of the bridge of the Lehigh Valley Railroad over the Susquehanna at this place, which was wrecked on June 6 by a derailed freight car.

TUCSON, ARIZ.—The Southern Pacific is building a new heavy iron bridge over the Chenauga River.

WAPAKONETA, OHIO.—Bids are wanted July 1 by the County Commissioners for the substructure and the superstructure of a steel bridge 170 ft. long over Auglaize River; also a steel bridge 125 ft. long over St. Mary's River, and a steel bridge 55 ft. long. W. H. Meyer is County Auditor.

WESTFIELD, N. Y.—At a recent meeting of the town board, a contract was awarded to the Rochester Bridge & Construction Co., of Rochester, N. Y., for building a new bridge over Chautauqua Creek.

WHEELING, W. VA.—Seven spans of the Baltimore & Ohio bridge at Parkersburg will be rebuilt at a cost of about $25,000. The new channel spans will be cantilevers. This bridge was partially rebuilt three years ago.

WESTFIELD, MASS.—Bids are wanted June 25 by the Board of Selectmen for building the superstructure of Pochassic Hill bridge.

WILBURTON, IND. T.—Recent heavy rains damaged several bridges between Haileyville and this place.

ZANESVILLE, OHIO.—Bids are wanted June 23 by the County Commissioners for the superstructure of a highway bridge in Springfield Township. L. E. Brelsford is Muskingum County Auditor.

### Other Structures.

ALLENTOWN, PA.—The Philadelphia & Lehigh Valley Traction Co. will soon issue bonds, the proceeds of which are to be used in building a new power house, lighting plant and machine shop.

BINGHAMTON, N. Y.—The Delaware, Lackawanna & Western, it is reported, has made surveys and is preparing plans for repair shops to take the place of those at Utica and Syracuse.

BUFFALO, N. Y.—Bids are wanted June 27 by L. Bush, Chief Engineer of the Delaware, Lackawanna & Western, Hoboken, N. J., for building a freight station two stories high 60 ft. x 475 ft. with steel frame. Work is to be commenced as soon as possible after the contracts are let.

CHICAGO, ILL.—The Pere Marquette, it is reported, has plans ready for building a freight house 50 x 800 ft. at Harrison and Franklin streets.

Cleveland, Ohio.—The Erie is making plans to build a 100-ft. single-span steel bridge at Scranton avenue to carry two tracks.

El Paso, Texas.—Plans for a new union passenger station have been approved by the railroads interested; it will cost about $25,000.

Louisville, Ky.—The Louisville & Southern Indiana Traction Co., it is reported, will build a new station at Third street.

Memphis, Tenn.—The Illinois Central will soon award contracts for building additions to its shops here, to include a blacksmith and boiler shop 84 ft. x 222 ft. and a machine shop 111 ft. x 120 ft., to cost, with the necessary equipment, which will be put in late in the summer, about $140,000.

Mobile, Ala.—The Southern, it is reported, will soon start work on its new passenger station; also on new docks.

New York, N. Y.—The Pennsylvania, it is reported, has given a contract to Isaac A. Hopper & Son for the excavation work and retaining walls for its new terminal station between Thirty-first and Thirty-third streets and Seventh and Ninth avenues, Manhattan.

Peru, Ind.—The Chicago, Cincinnati & Louisville, it is reported, is making plans for putting up a wood-working shop here.

Philadelphia, Pa.—The Philadelphia & Reading will soon let a contract for building a new passenger station at a point between Oak Lane and Melrose. It is to be of stone 30 x 86 ft.

South Tacoma, Wash.—The Northern Pacific has commenced work on its new boiler shops here. Deeks & Deeks have the contract for the work at about $75,000. The company will also spend a similar amount in enlarging its shops at Edison, Wash., during the summer.

Washington, D. C.—Bids for the foundations of the new Municipal Building for the District of Columbia were opened on June 8 by Capt. Chester Harding, U. S. A. Thirteen bids were submitted, the lowest being that of Norcross Brothers, of Worcester, Mass., $185,111, and the next lowest that of A. B. Stannard, of New York, at $189,880.50, the other bids being as follows: Tatterson & Thurman, Baltimore, $190,537.50; E. Saxton, Washington, $203,700; Wells Brothers' Construction Company, New York, $218,862.50; Cranford Paving Company, Washington, $226,685; Doyle & Doak, Philadelphia, $230,970; Thompson & Starrett Company, New York, $236,063; John Gill & Sons, Cleveland, $247,092.50; J. E. & A. L. Pennock, Philadelphia, $243,617.50; James L. Parsons, Washington, $265,937.50; Horton & Hemingway, Boston, $271,733; J. P. Carlin & Co., Brooklyn, $295,000. Norcross Brothers failed to inclose with their bid the check for $5,000 required by the specifications, and the contract will probably be let to the next lowest bidder. Cope & Stewardson, architects, of Philadelphia, are now preparing plans for the superstructure for which bids will be asked late in the fall.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Bay City & Port Huron.—Incorporation has been granted this company in Michigan with an authorized capital stock of $1,000,000. It is proposed to build from Bay City through the Counties of Bay, Tuscola, Sanilac and St. Clair to Port Huron, 100 miles. C. A. Collins, H. E. Buck, W. C. Pennoyer, W. W. Wixson and others, of Bay City, Mich., are incorporators.

Buffalo & Susquehanna.—Press reports state that 26 miles of track have been completed on the extension from Sinnemahoning, Pa., to Sykesville, N. Y., 56 miles. It is stated that track will be laid as far as Tyler by July 1. An official of the road is quoted as saying: "The location of the line has been made so as to obtain the easiest grade possible, the maximum grade on this division being only .5 per cent. In order to obtain this low grade, three tunnels have had to be built." The bridge across the B., R. & P.'s tracks near DuBois, is practically finished. Grading is now in progress between Wellsville, N. Y., and Belfast on the extension from Wellsville to Buffalo.

Chihuahua & Pacific.—Press reports state that as soon as the extension of this road is completed from Minaca to Temosachic, the road will be continued west through Temosachic to a point on the Pacific coast of Mexico. The grading will probably be done by Ryan & Dudley, the contractors who are now building the extension from Minaca. G. B. Schley, 80 Broadway, New York, is President, and T. J. Brennan, Secretary.

Cleveland, Cincinnati, Chicago & St. Louis.—Press reports state that 36 miles of second track on the St. Louis Division east of St. Louis has been completed and that the eight miles yet to be laid has been graded and will be finished by August 1.

Erie.—Bids are now being asked by this company for the construction of new ferry slips and a passenger station at Twenty-third street and North River, New York. W. L. Derr, Havemeyer Building, 26 Cortlandt street, New York, is in charge of the work, and K. M. Murchison, 5 West Thirty-first street, is the architect of the buildings. It is stated that a lighting plant will be installed to generate the current for this station and for the new stations of the C. R. R. of N. J. and the D., L. & W., which are now being built at and near Twenty-third street.

Little River.—It is reported that this road has completed its main line from Maryville, Tenn., to Cades Cove, 26 miles. Work is now in progress on the branch line from a point near Townsend southwest for a distance of four miles. G. B. Townsend, Townsend, Tenn., is Chief Engineer.

Marin Shore R. R.—Incorporation has been granted this company in California to build a railroad from San Rafael in a northerly direction to Point Pedro and thence to Ignacio, 20 miles. The new line will parallel the California Northwestern between these points. J. A. McNear and G. P. McNear, both of Petaluma, Cal., are incorporators.

Mexican Roads.—A concession has been granted by the Mexican Government to Alfredo de Gonzalez, Manager of the La Mariposa Mining Co., to build a railroad from Gallego, on the Mexican Central, to the mines of the company. Surveys are now in progress and the contract for building the line will be let as soon as the location is finished.

The Mexican Government has granted a concession to the Compania de los Ferrocarrilles Urbano y Agricola de Oaxaca to build a railroad from San Juan Chapultepec, in the state of Oaxaca, to Ayoguezco, 40 miles. According to the terms of the concession, the road must be completed within six years. L. R. Pineda, City of Mexico, is the legal representative of the company.

The Mexican Government has granted a concession to Thomas McManus on behalf of the Dicha Mining & Smelting Co. for building a railroad from the port of Puerto Marquez to the mines of the company at La Dicha. The concession also provides that the line may be eventually extended north from La Dicha to Chilpancingo. Surveys will be begun at once and the road must be completed within five years.

Natural Bridge R. R.—This company has been organized in Georgia to build a railroad in the western part of Florida. The proposed route is from Moody, Fla., east to Wacissa, 15 miles. Connection will be made with the Tallahassee Southeastern at Wacissa and with the Seaboard Air Line at Moody. The road will run through a large tract of fine timber land owned by the Georgia-Florida Pine Co. W. C. Vereen is President and F. G. Boatright, Manager, both of Moultrie, Ga.

Northern Pacific.—An officer writes confirming the report that a contract has been let to Winters, Parsons & Boomer, of Spokane, Wash., for building an extension of the Bitter Root branch from Charlos, Mont., in a southerly direction to Darby, 7.8 miles. The work is light, following the valley of the stream for the entire distance, and the line will be completed in about five months. (June 10, p. 450.)

Pennsylvania.—A contract has been awarded to H. S. Kerbaugh, Philadelphia, for building a cut-off 1½ miles long at Highspire, near Harrisburg.

The contract for the foundation and preliminary work on the Duquesne elevated line at Pittsburg has been awarded to Drake, Stratton & Co., of Philadelphia. This elevated road will start from a connection with the Pennsylvania tracks just west of the union station and will pass along Duquesne Way over Ninth, Seventh, Sixth, Fifth, Fourth and Third streets to a point near the junction of Water street, Duquesne Way and Pennsylvania avenue. (June 10, p. 450.)

The Blacklick extension of the Cambria & Clearfield Division, running from Blacklick, Pa., to Wehrum, 17 miles, has been completed and is now in operation. The line is ballasted with broken stone and is laid with 80-lb. rails.

Philadelphia & Reading.—The contract for a third track between Phœnixville, Pa., and Perkiomen Junction, 2½ miles, has been let to Smith & Campion. Work will be begun at once, but will not be completed until fall, as there are a number of heavy cuts and fills to make.

Philippine R. R.—Articles of incorporation have been filed by this company in New Jersey. The object of the company is to operate and maintain a railroad in the Philippine Islands. F. W. Mattocks, Demarest, N. J., is one of the incorporators.

Tennessee Central.—A contract is reported let to M. N. Elkan, Knoxville, Tenn., for building a short line in Nashville. This is the first contract which has been let by the road in pursuance of its plans for improving its terminal facilities in and about Nashville. W. N. McDonald is Chief Engineer.

St. Louis, Kansas City & Colorado (C., R. I. & P.).—A circular has been issued by this company announcing that it has finished and is operating its line between St. Louis and Windsor, Mo., 216 miles. The remainder of the line, between Windsor and Kansas City, 81 miles, is practically completed and will be open for business within a few weeks. Through train service has been established between St. Louis and Kansas City via Windsor and Clinton and will be maintained until the completion of the line via Pleasant Hill.

St. Louis, Little Rock & Gulf.—The contract for building this line has been awarded to the Arizona Construction & Improvement Co. The first portion of the line to be built will be from Little Rock, Ark., to Winnfield, La. The work will include several long bridges and trestles and will necessitate the excavation of 406,000 cu. yds. of embankment. The road is projected to run through the States of Arkansas, Louisiana and Texas for a distance of about 375 miles. A. L. Hale, Little Rock, Ark., is President. (June 3, p. 430.)

Southern Pacific.—This company is planning an extension of its Imperial branch into Lower California. An officer writes that the proposed line will start from a connection with the Imperial branch near Calexico on the boundary line between the United States and Lower California. It will then run in an easterly direction for a distance generally parallel to the boundary to a point near Hanlons. The total length will be about 510 miles. Preparations are now being made for beginning the work, but it has not yet been definitely decided when contracts for grading will be let. The character of the work is not difficult as the grades and curves will both be light. (See Construction Supplement.)

STEUBENVILLE & CANTON.—This company has been incorporated in Ohio to build a railroad from Steubenville through Jefferson, Carroll and Stark counties northwest to Canton, 45 miles. T. H. Lucas, H. H. Smith, S. B. Pyle and others, of Steubenville, Ohio, are incorporators.

TEMISKAMING & NORTHERN ONTARIO.—The contract for building the extension of this road from New Liskeard in a northerly direction to a connection with the proposed Grand Trunk Pacific, about 100 miles, has been let to A. R. MacDonnell. It is stated that work will be begun at once. W. B. Russell is Chief Engineer. (May 20, p. 392.)

WESTERN MARYLAND.—By the recent decision of the State Court of Appeals of Maryland, the last obstacle to the completion of this company's line between Cumberland, Md., and Cherry Run, W. Va., 65 miles, has been removed. The court has sustained the right of the Western Maryland to build bridges and condemn rights of way across the property of the Chesapeake & Ohio Canal. The suit of the latter company to prevent this crossing was made in behalf of the Baltimore & Ohio.

YOSEMITE PARK ELECTRIC.—A franchise has been granted by the Secretary of the Interior to a syndicate of San Francisco and San Jose capitalists for building an electric railroad into the Yosemite National Park. This is the first franchise ever granted by the United States Government for an electric road into any government reservation. The road will begin at Merced, and running north to the Merced River, will follow the windings of the river into the valley. Under the terms of the franchise, stations must be built every 10 miles. It is announced that work will be begun this summer. The running time from Merced to the park over the new line will be between five and six hours.

## RAILROAD CORPORATION NEWS.

AUGUSTA & ELBERTON.—The stockholders of this company have authorized a bond issue of $750,000. The bonds are to run for 20 years from July 1, 1904, and will bear 6 per cent. interest. The proceeds from the sale of these bonds will be used to pay for building the line from Augusta, Ga., to Elberton, 60 miles. Grading on this line will be begun within three weeks. C. Bruce Young, Augusta, Ga., is President.

BUFFALO & WILLIAMSVILLE (ELECTRIC).—The State Railroad Commission of New York has granted this company authority to issue $3,500,000 mortgage bonds with the condition that but $500,000 shall be issued at the present time. The proceeds from the sale of these bonds will be used to pay for an extension to Rochester.

CHICAGO & EASTERN ILLINOIS.—The semi-annual dividend on the common stock payable on July 1 will, it is announced, be at the rate of 10 per cent. per annum as against 6 per cent. paid regularly since July, 1902. The *Commercial and Financial Chronicle* says: "The new rate places the stock trust certificates issued by the St. Louis & San Francisco in exchange for the stock on the same dividend basis. As substantially all of the $7,217,800 common stock outstanding is owned by the St. L. & S. F., the latter's income will gain $285,968 annually by the increase in the dividend rate on the C. & E. I.

CHICAGO, BURLINGTON & QUINCY.—According to a decision handed down by the Supreme Court of Massachusetts, the directors of this company have been granted the right to change the rate of interest from 3½ to 4 per cent. on $4,992,000 bonds. The New England Trust Company, as trustee, will cancel the bonds at 3½ per cent., which it now holds, and will deliver new 4 per cent. bonds to the same amount.

CINCINNATI, HAMILTON & DAYTON.—It has been officially announced that the control of this company has been bought by a syndicate of New York and Boston capitalists, including several members of the Pere Marquette syndicate. This syndicate, however, does not in any way represent the Pere Marquette, and, although the controlling interest in the C. H. & D. has passed into other hands, some of the most prominent interests in the former ownership will continue to be associated in the new control. The C. H. & D. and Pere Marquette have made joint arrangements with the Toledo Belt Line for the use of the Toledo property, which forms a connection between the two roads. The C. H. & D. and Pere Marquette will be operated in harmony, but for the present there is not the slightest prospect of their being merged.

CLEVELAND & PITTSBURG.—An officer writes that $7,000,000 of the $11,000,000 new capital stock to be issued will be used for completing the second track of the main line out of Cleveland and for eliminating grade crossings in that city by the elevation of the tracks from the union station to the city limits.

INTERBOROUGH RAPID TRANSIT (NEW YORK).—This company has declared a dividend of 2 per cent. payable on July 1 to holders of stock of record June 20. This is the first dividend declared by the company and is payable out of the surplus earnings under the lease of the Manhattan elevated railway. The outstanding stock on which the dividend will be paid amounts to $35,000,000.

NEW YORK CENTRAL & HUDSON RIVER.—J. P. Morgan & Co. have sold $10,000,000 of the $30,000,000 bond issue which was recently authorized at a meeting of the directors. These bonds will bear 4 per cent. interest and will run for a period of 30 years. The subscription to these bonds was opened at 10 o'clock on June 14 and the issue was over-subscribed. With regard to the purposes for which these bonds will be used, President Newman writes J. P. Morgan & Co. as follows: The authorized issue of such debentures is limited to an aggregate of $50,000,000 at any one time outstanding. All the debentures are subject to the provisions of an indenture dated May 12, 1904, made with the United States Trust Co. of New York as trustee. This indenture provides that as long as any of said debentures are outstanding and unpaid the railroad company shall not make any mortgage upon its railroad without including in the new mortgage every debenture of this issue.

NEW YORK, NEW HAVEN & HARTFORD.—This company has bought Brown's wharf at Providence for a sum stated at $220,000. By acquiring this property, the New York, New Haven & Hartford now controls the water front at Providence from Fox Point to India Point, with a frontage of about 4,500 ft.

It is stated that this company is considering plans for issuing $10,000,000 refunding mortgage bonds to take up the $6,000,000 seven per cents and the $4,000,000 six per cents of the Central New England which mature on Jan. 1, 1905, the new bonds to bear interest at 4 per cent.

NORTHERN SECURITIES CO.—A circular has been issued to the stockholders of this company by James J. Hill, the President, defining the status of the company since the institution of the suit to prevent the distribution of the various properties controlled by the company. The circular assures the shareholders that, although dividends have been enjoined temporarily, the money to pay for them has been deposited in banks and that the dividends will be paid as soon as the legal restrictions are removed.

ROCK ISLAND CO.—This company has notified the New York Stock Exchange of a reduction in its preferred stock from $51,192,000 to $48,692,000. The stock thus returned to the treasury represents part of the price paid to the Southern Pacific for one-half interest in Texas lands belonging to the S. P. The courts of Texas declared that the Rock Island could not own lands purchased from the Southern Pacific, the latter being a parallel line.

UNION PACIFIC.—Kuhn, Loeb & Co. have paid to the original subscribers of the $10,000,000 five per cent. U. P. notes issued in August, 1903, a profit of three-quarters of one per cent. The bankers are enabled to do this through the sale of the Oregon Short Line 4 per cent. participating bonds which secured the notes. These notes are for $5,000 each and are due on Feb. 1, 1905, without option of earlier redemption.

## EDITORIAL ANNOUNCEMENTS:

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

*ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

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